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# REVISION OF JAPANESE CALLIANASSIDS BASED ON THE VARIATIONS OF LARGER CHELIPED IN *CALLIANASSA PETALURA* STIMPSON AND *C. JAPONICA* ORTMANN (DECAPODA : ANOMURA)

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*With Plates IX–XV and 8 Text-figures*

**Contents**



## I. Introduction

Some species of the genus *Callianassa* are reported from Japan as follows.

1. *C. petalura* STIMPSON, 1860
2. *C. subterranea* var. *japonica* ORTMANN, 1891
3. *C. harmandi* BOUVIER, 1901

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4. *C. californiensis* var. *japonica* BOUVIER, 1901
5. *C. gigas* var. *japonica* MAKAROV, 1935
6. *C. gigas* var. *eoa* MAKAROV, 1938
7. *C. californiensis* var. *bouvieri* MAKAROV, 1938

The features of these species have often been described, however, their classification is not always definite. DE MAN (1928a, p. 15) remarked upon *C. harmandi* as "The nearest related species is no doubt *Call.* (*Trypaea*) *japonica* (ORTM.),..." He stated that these two species resemble each other closely in the smaller cheliped, the first and second antennae, the abdomen and the caudal fan, but differ in the morphology of rostrum and cheliped and also slightly in eyestalks. He (1928a, p. 18) wrote further about *C. californiensis* var. *japonica* that "From a careful examination of this specimen I draw the conclusion that it is *identical* with *Call.* (*Trypaea*) *japonica* (ORTM.). The type, 36 mm. long, indeed fully agrees, even in minute particulars, with the *equally long* male of *C. japonica, except only the chelipeds of the Ist pair.*" MAKAROV (1938, p. 73) described on *C. californiensis* var. *bouvieri*, which is treated in this report as the same species with *C. californiensis* var. *japonica*, as "If also in the future only males of this species are captured, it will be obvious that they belong to *C. japonica*, ....."

Regarding *C. petalura* STIMPSON, BORRADAILE (1903) and DE MAN (1928b) cast a great doubt on the validity of this species. BALSS (1914) concluded that *C. petalura* is synonymous with *C. japonica*. YOKOYA (1930, 1939) applied, without any definition, two different names *C. japonica* and *C. petalura* to his specimens. On the other hand, MAKAROV (1935) reported *C. gigas* var. *japonica* as a new species from the Sea of Japan, without any reference to STIMPSON's species.

In this report, the Japanese Callianassid species are reviewed on the specimens* gathered from around the Japanese Islands, and after all it is concluded that they are classified into two species, *C. japonica* ORTMANN, 1891 and *C. petalura* STIMPSON, 1860. As noted already the morphology of larger cheliped has been regarded as the most important specific criterion separating closely allied Callianassids from one another. For this reason, in the course of examining the gathered specimens, the morphological variations of larger cheliped are arrayed and compared one another carefully to find if any range of the series of variations can be defined distinctly refering to the species already reported.

I wish to express here my hearty gratitude to Dr. S. MIYAKE of Kyush University for allowing me to avail his specimens, to Drs. John S. GARTH and Janet HAIG of Allan Hancock Foundation, University of Southern California, who kindly lent me their specimens of *C. californiensis* DANA for comparison with Japanese specimens, and also to Dr. T. TOKIOKA of Kyoto University, who has given me the chance to publish this paper.

* All the specimens dealt with in this paper are deposited at Zoological Laboratory, Kyushu University, Fukuoka,

## II. Material and method

**Material: A.** *Callianassa japonica* ORTMANN, 1891

The material defined as *C. japonica* contains 241 specimens, 158 males and 83 females, inclusive of 26 ovigerous ones. Their data including localities, dates and collectors' names are shown in Table 1, and their dimensions are given in Table 3.

The present specimens were gathered from around Japan, from Kyushu to Hokkaido. Among them, the specimens from Higashihama Beach in Kyushu Island are unique in being lesser in body size than those from any other locality. Of 110 males of the body length 15.0–44.0 mm, only two, Cat. Nos. 9196 (44.0 mm) and 9159 (41.0 mm), are larger than 40.0 mm. The females are 41, inclusive of 18 ovigerous ones, and from 15.0 to 32.0 mm in body length, except one larger specimen, Cat. No. 9118, which is 38.0 mm in body length. The smallest ovigerous specimen is 25.0 mm (Cat. Nos. 9097, 9141 and 9180). The exact condition which causes the undersized state of inhabitants on Higashihama Beach is unknown. It seems, however, very probable that the population density on Higashihama Beach is responsible for the phenomenon. There, the inhabitants are crowded so densely that even a scoopful of sand will contain two or three of them; while in the other localities it is hardly possible to collect so many specimens as on Higashihama Beach.

A lot of specimens of the standard size were collected on Momoji Beach in Hakata Bay and at the estuary of the Muromi River boardering the west of Momoji Beach. This material contains 36 specimens, 22 males and 14 females inclusive of 3 ovigerous specimens, which are mostly 35.0–58.0 mm in body length.

**B.** *Callianassa petalura* STIMPSON, 1860

In all 59 males and 57 females inclusive of 23 ovigerous ones were examined; their data are shown in Tables 2 and 4.

Besides the specimens from various places of Japan, two males and two females inclusive of one ovigerous one from the type locality, Shimoda (Cat. Nos. 3001–3004), were examined for a comparison with STIMPSON's description. The collection from Tsuyazaki Beach, Fukuoka, is remarkable in its size; 40 males (10.5–46.0 mm) and 37 females (10.0–40.0 mm) inclusive of 12 ovigerous ones (23.0–35.0 mm) are included. Tsuyazaki Beach is facing the open sea, consists of very fine sand, and is unsuitable for burrowing. Such circumstances are quite similar to those in Shimoda.

**Method:** The measurements were made in the following methods.

Measurement of the body length was made for the stretch from the tip of rostrum to the posterior margin of telson. A piece of thread was fitted along the center line of the body and marked for the above-mentioned stretch. Then the span between the marks was applied to a millimeter steel scale.

Measurements of the larger cheliped (Fig. 1) were made as follows, and the treat-

ments of respective parts (2–6) were done under the stereo microscope.

1. Total length (TL). The cheliped was extended, and the maximum length between the ischium and chela was measured.

2. Length of the merus (ML). The distance between the proximal and distal articulations was measured.

3. Length of the carpus (CL). The distance between the proximal articulation to the merus and the distal swelling above the articulation to the palm was measured.

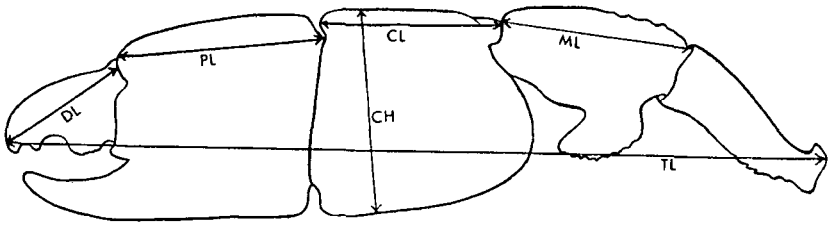


Fig. 1. Diagram of larger cheliped of *Callianassa*,
TL, total length of larger cheliped. ML, merus length. CL, carpus length. CH, carpus height. PL, palm length. DL, dactylus length.

4. Height of the carpus (CH). The maximum height was measured.

5. Length of the palm (PL). The distance between the proximal articulation to the carpus and the distal swelling just above the articulation to the dactylus was measured.

6. Length of the dactylus (DL). The distance between the articulation to the palm and the tip was measured.

## III. Variation in the morphology of larger cheliped

To see the variations in the larger cheliped, the following parts of the larger cheliped were examined closely: the cutting edge of dactylus, the distal margin of palm and its connection with the fixed finger, and the cutting edge of fixed finger.

### A. Variations in *C. Japonica* Ortmann:

*1. Variation of the cutting edge of dactylus.* There are three groups (A-C) and fourteen types (D1–D14) of variations (Fig. 2).

*A group.* The first A group containing D1 and D2 types is characterized by the cutting edge which is rather straight and smooth to a little serrulate and the tip slightly bending down.

D1. The cutting edge is rather straight on the whole.

D2. The cutting edge swells slightly and gently towards the proximal portion.

*B group.* This group contains six types D3, D4, D4′, D5, D6 and D7 which are respectively defined on the successive grades of formation of a squarish swelling at the

proximal part of cutting edge, and of development of serrulation on the whole edge.

D3. The cutting edge curves down gently toward the tip.

D4. The distal bending distinct, the interior angle about 90° or more.

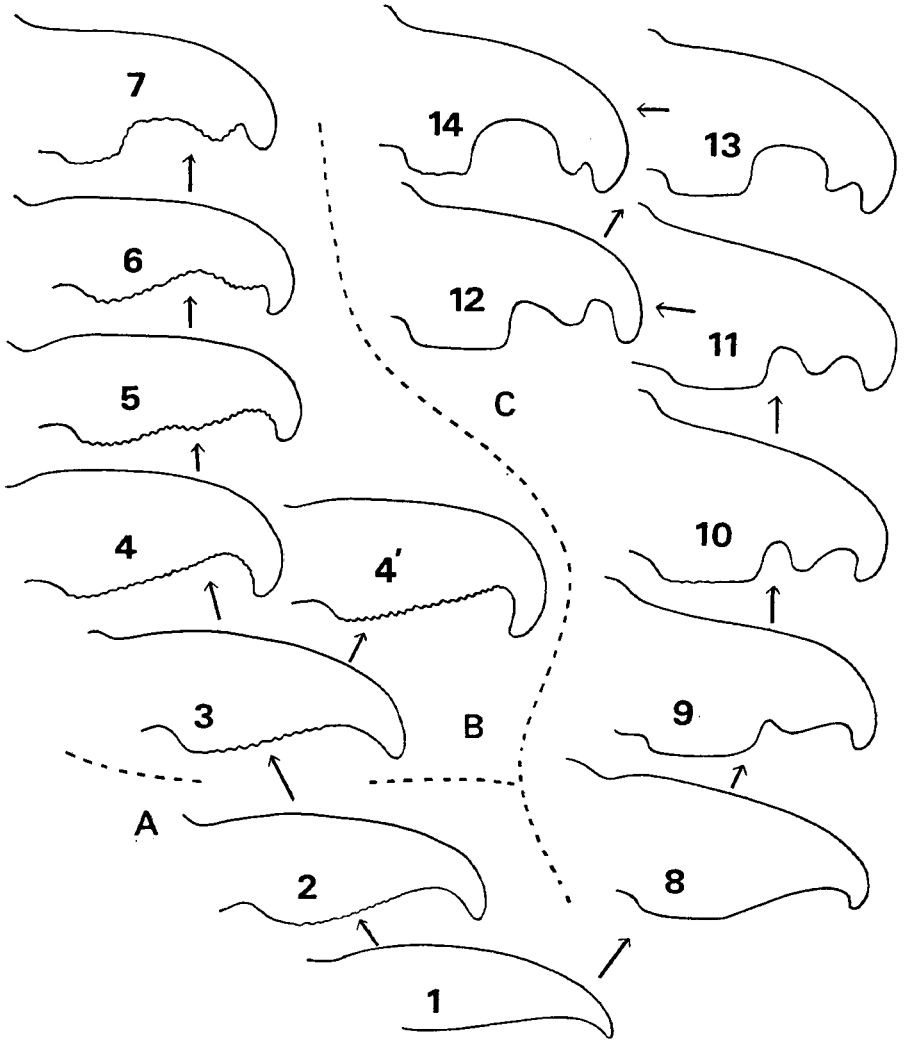


Fig. 2. Diagrams showing the variations of dactylus of the larger cheliped in *Callianassa japonica*. Fourteen types (D1–D14) are shown in three groups (A-C).

D4′. The distal bending more pronounced, the interior angle smaller than 90°.

D5. The cutting edge becomes undulated, the tip bends down strongly.

D6. The cutting edge becomes concave in the distal half. The tip bends down strongly to form inside another smaller concavity.

D7. Now, there are two concavities on the cutting edge. The broader and deeper proximal concavity is situated at a little distance from the proximal swelling. The tip curves down markedly.

*C group.* The third group is constituted of seven types D8, D9, D10, D11, D12, D13 and D14, in which the cutting edge is provided proximally with a broad truncate tooth and distally with two concavities of variable forms, but D8.

D8. The dactylus is rather short and stout. The cutting edge is a little swollen out proximally, but in the distal half it becomes gradually narrowed toward the tip and is furnished with a row of irregular serration.

D9. The cutting edge bears in the proximal half a broad truncate tooth which is followed distally by a small but deep concavity. The tip curves down abruptly forming inside another broad but shallow concavity.

D10. The proximal truncate tooth looks like that in D9, but in the distal half two concavities, especially the distal concavity, become deeper.

D11. The truncate tooth as in D10. Two concavities in the distal half are now almost the same in size and shape.

D12. The truncate tooth is not so broad as in D9, D10 and D11. Contrary to the state in D9 and D10, the proximal concavity becomes broader than the distal one.

D13. This type roughly resembles D12, but the proximal concavity is now as broad as the truncate tooth.

D14. The truncate tooth is more narrowed. The proximal concavity is extremely large, while the distal concavity is much smaller.

In the material from Higashihama Beach, C group comprises 55 males but no female, B group comprises 44 males and 6 females, and A group consists of 9 males and 33 females. In the material from the estuary of the Muromi River and Momoji Beach, C group comprises only 12 males, B group 7 males and 12 females, and A group only one female.

Throughout the whole samples, C group is limited to the male, but A and B groups comprise each both males and females. Males of C and B groups were collected together at Kanazawa-hakkei, the estuaries of the Ohta and Muromi Rivers, and on Higashihama Beach.

2. *Variation of palm.* The distal margin of the palm and its connection with the fixed finger are variable, too. Variations are, however, grouped into seven major types (Fig. 3).

P1. The distal margin of palm is smooth, evenly connected with the fixed finger.

P2. The distal margin bears a small outgrowth just near the lower corner.

a. The outgrowth is small and simple, with the tip round or pointed.

b. The outgrowth is distinct and divided into two or more at the tip.

P3. The outgrowth on the distal margin is bent down to cover slightly the proximal part of the fixed finger.

a. The outgrowth is simple.

b. The outgrowth divided at the tip.

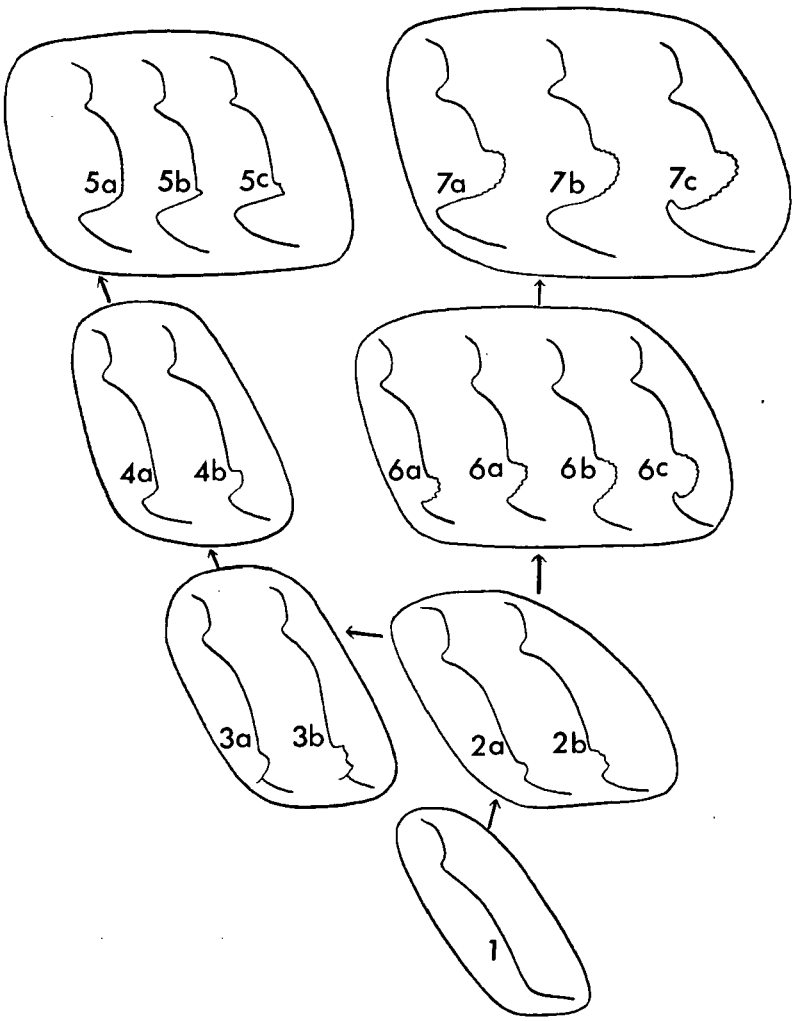


Fig. 3. Diagrams showing the variations of the distal part of palm of the larger cheliped in *Callianassa japonica*. Seven types (P1–P7) are shown.

P4. The distal margin of palm is separated by a broad notch from the fixed finger. The notch is not so deep as to reach the perpendicular line drawn to the lower margin of palm from the articulation to the dactylus.

a. The distal margin is evenly connected with the broad notch.

b. The distal margin bears an outgrowth just before it reaches the notch,

the outgrowth is dentiform or subacute.

P5. The broad notch is very prominent and very deep to reach beyond the perpendicular line mentioned above.

a. The distal margin is smooth.

b. The distal margin bears an outgrowth which is dentiform or subacute.

c. The outgrowth is dentiform and denticulated at the tip.

P6. The distal margin forms a prominent denticulate lobe near the lower corner, and there is a distinct notch between this lobe and the fixed finger. The notch is not so deep as to reach beyond the perpendicular line mentioned above for P4.

a. The lobe on the distal margin is small and seldom extends downward over the proximal part of the fixed finger, and the notch is roughly triangular in shape.

b. The notch broadened and with a round bottom.

c. The lower side of the lobe is embraced basally by a hooked slit formed at the bottom of the notch.

P7. The denticulated lobe on the distal margin is very broad. The notch is enlarged, too and becomes much deeper to extend beyond the perpendicular line.

a. The notch is triangular in form.

b. The notch is a little enlarged to have a round bottom.

c. The notch bottom forms a hooked slit as in P6–c to embrace basally the lower side of the lobe.

Of these palm forms, P4, P5, P6 and P7 are found in the male. On the other hand, all the females are closely related to P1, P2 and P3. As to the relation of the palm shapes to the dactylus forms, it is shown that P4 and P5 are strongly combined with C group of the dactylus, and P6 and P7 with B group.

*3. Combinations between the variations of dactylus and palm.* Combinations of the palm forms with the dactylus shapes are checked on respective specimens as follows. For the combinations of the dactylus types with those of palm see Table 5.

1. Specimens with P1 (Fig. 4).

Male:

| Combination | Individual | Locality |
|---|---|---|
| D2–P1 | 1 | Najima 1 ind. |
| Female: | | |
| D1–P1 | 2 | Higashihama 2 ind. |
| D2–P1 | 2 | Higashihama 1, Najima 1 |
| D3–P1 | 1 | Muromi 1 |

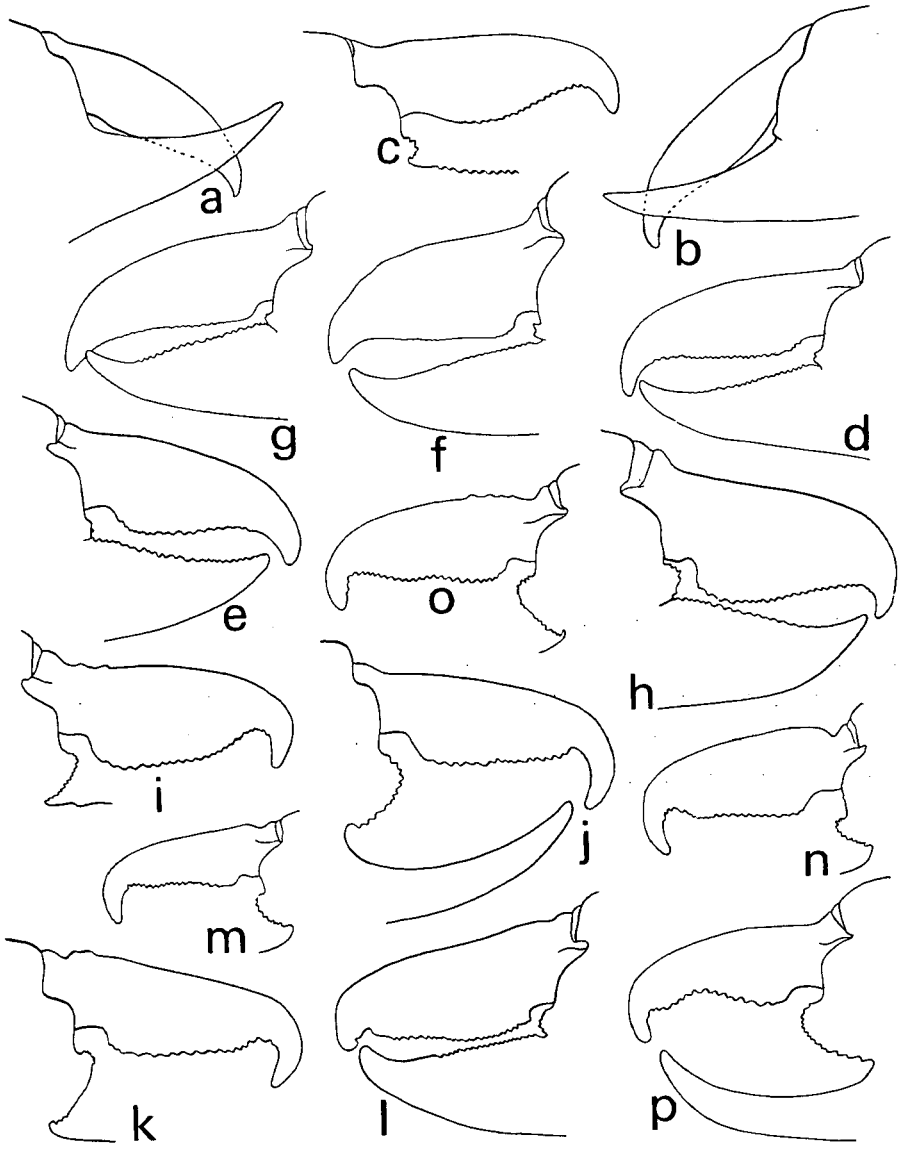


Fig. 4. Distal part of the larger cheliped of *Callianassa japonica*.
a: A female from Higashihama Beach, Amakusa I., Cat. No. 9143, showing the form D1–P1. b: A female from Higashihama Beach, Cat. No. 9134, D2–P2a. c: A male from Higashihama Beach, Cat. No. 9106, D2–P6a. d: A male from Ujina, Hiroshima, Cat. No. 7010, D3–P3b. e: A male from the estuary of the Muromi River, Hakata Bay, Cat. No. 9046, D3–P3b. f: A male from the estuary of the Muromi River, Cat. No. 9051, D3–P3b. g: A female from the estuary of the Muromi River, Cat. No. 9052, D3–P3b. h: A male from Kanazawa-hakkei, Tokyo Bay, Cat. No. 3002, D4–P6a. i: A male from the estuary of the Ohta River, Hiroshima, Cat. No. 7025, D4–P6a. j: A male from Higashihama Beach, Cat. No. 9062, D4′–P7c. k: A male from Higashihama Beach, Cat. No. 9109, D4′–P7c. l: A male from the estuary of the Muromi River, Cat. No. 9041, D5–P6a. m: A male from Higashihama Beach, Cat. No. 9065, D5–P7b. n: A male from Higashihama Beach, Cat. No. 9105, D5–P7b. o: A male from the estuary of the Ohta River, Cat. No. 7022, D5–P7c. p: A male from the estuary of the Muromi River, Cat. No. 9094, D6–P7b.

Most of the specimens with P1 are smaller in body size, except for a female (Cat. No. 9043) from Muromi, Hakata Bay, which is 45.0 mm.

2. Specimens with P2 (Pl. IX and Fig. 4).

| | | | |
|---|---|---|---|
| Male: | | | |
| | D2–P2a | 2 | Higashihama 1, Ujina 1 |
| | D2–P2b | 1 | Higashihama 1 |
| | D3–P2a | 4 | Muromi 1, Ujina 2, Ohta 1 |
| | D3–P2b | 2 | Higashihama 1, Ujina 1 |
| Female: | | | |
| | D2–P2a | 4 | Higashihama 4 |
| | D2–P2b | 26 | Higashihama 24, Muromi 1, Ohta 1 |
| | D3–P2a | 1 | Najima 1 |
| | D3–P2b | 15 | Higashihama 4, Muromi 3, Ohta 3, Ujina 2, Najima 1, Zaimokuza 1, Tatara 1 |

The males with P2 are few, though most of the females show the characteristic of P2. The combinations of D2–P2b and D3–P2b are found very frequently in females, but it is to be noted that most of the specimens of the first combination came from Higashihama, while most of those of the last combination came from other localities than Higashihama.

3. Specimens with P3 (Fig. 4).

| | | | |
|---|---|---|---|
| Male: | | | |
| | D2–P3a | 1 | Higashihama 1 |
| | D3–P3b | 5 | Ujina 2, Najima 1, Muromi 2 |
| Female: | | | |
| | D2–P3a | 1 | Higashihama 1 |
| | D2–P3b | 1 | Higashihama 1 |
| | D3–P3a | 5 | Higashihama 1, Ujina 1, Najima 1, Momoji 1, Muromi 1 |
| | D3–P3b | 14 | Higashihama 1, Muromi 5, Momoji 1, Najima 1, Tatara 1, Ohta 1, Kanazawa-hakkei 2, Funka Bay 2 |

The specimens with P3 are mostly females; the combination of D3–P3b is seen most frequently.

4. Specimens with P4 (Pls. XI–XII and Fig. 5).

Male:

| | | |
|---|---|---|
| D 2–P4a | 2 | Higashihama 2 |
| D 8–P4b | 1 | Muromi 1 |
| D 9–P4b | 2 | Muromi 2 |
| D10–P4b | 4 | Higashihama 1, Muromi 2, Najima 1 |
| D11–P4b | 1 | Arao 1 |
| D12–P4b | 1 | Ohta 1 |
| D13–P4b | 1 | Kanazawa-hakkei 1 |

The specimens with P4 are generally connected with the C group in the morphology of dactylus. They are rather few, but distributed widely throughout the localities.

5. Specimens with P5 (Pls. X–XII and Fig. 5).

Male:

| | | |
|---|---|---|
| D 7–P5c | 1 | Funka Bay 1 |
| D 8–P5b | 3 | Higashihama 3 |
| D 9–P5a | 1 | Muromi 1 |
| D10–P5a | 1 | Higashihama 1 |
| D10–P5b | 9 | Higashihama 9 |
| D11–P5b | 8 | Higashihama 7, Okayama 1 |
| D12–P5a | 9 | Higashihama 9 |
| D12–P5b | 17 | Higashihama 17 |
| D12–P5c | 4 | Higashihama 1, Muromi 2, Momoji 1 |
| D13–P5a | 2 | Higashihama 1, Okinoshima 1 |
| D13–P5b | 4 | Higashihama 4 |
| D13–P5c | 2 | Higashihama 1, Muromi 1 |
| D14–P5a | 1 | Higashihama 1 |
| D14–P5b | 4 | Muromi 2, Najima 1, Okinoshima 1 |

The type P5 is found only in the male, and the major combinations with the types of dactylus are D10–P5b, D11–P5b, D12–P5a and D12–P5b. The specimens with P5 are generally combined with the C group of dactylus, except for the specimen Cat. No. 1001 which shows the combination D7–P5c.

6. Specimens with P6 (Pl. IX and Fig. 4).

Male:

| | | |
|---|---|---|
| D2–P6a | 4 | Higashihama 4 |
| D3–P6a | 1 | Higashihama 1 |
| D4–P6a | 14 | Higashihama 10, Ohta 3, Kanazawa-hakkei 1 |
| D4–P6b | 2 | Higashihama 2 |
| D4–P6c | 5 | Higashihama 5 |
| D4′–P6a | 1 | Higashihama 1 |
| D4′–P6b | 1 | Higashihama 1 |
| D5–P6a | 1 | Muromi 1 |

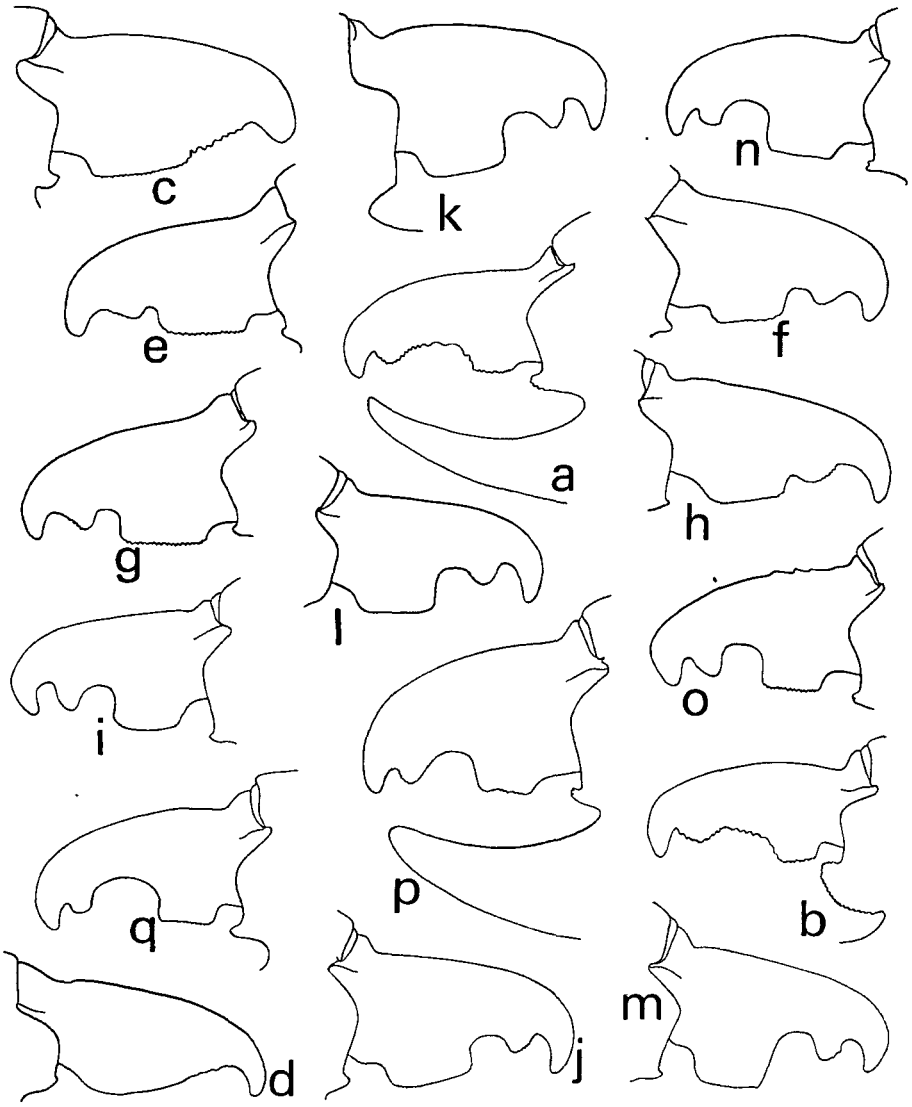


Fig. 5. Distal part of the larger cheliped of *Callianassa japonica*.
a: A male from Funka Bay, Hokkaido, Cat. No. 1001, showing the form D7–P5c. b: A male from Momoji Beach, Hakata Bay, Cat. No. 9021, D7–P7b. c: A male from the estuary of the Muromi River, Cat. No. 9036, D8–P4b. d: A male from Higashihama Beach, Cat. No. 9163, D8–P5b. e: A male from the estuary of the Muromi River, Cat. No. 9029, D9–P4b. f: A male from the estuary of the Muromi River, Cat. No. 9035, D10–P4b. g: A male from Najima Beach, Hakata Bay, Cat. No. 9013, D10–P5b. h: A male from Higashihama Beach, Cat. No. 9086, D10–P5b. i: A male from Higashihama Beach, Cat. No. 9121, D11–P5b. j: A male from the estuary of the Ohta River, Cat. No. 7015, D12–P4b. k: A male from Higashihama Beach, Cat. No. 9082, D12–P5a. l: A male from Higashihama Beach, Cat. No. 9160, D12–P5a. m: A male from Higashihama Beach, Cat. No. 9159, D12–P5b. n: A male from Momoji Beach, Cat. No. 9017, D12–P5c. o: A male from the estuary of the Muromi River, Cat. No. 9034, D12–P5c. p: A male from Kanazawa-hakkei, Cat. No. 3001, D13–P4b. q: A male from Najima Beach, Cat. No. 9007, D14–P5b.

The specimens with P6 are combined with D2, D3, D4, D4′ and D5, and the major combination is D4–P6a.

7. Specimens with P7 (Pl. X and Figs. 4–5).

Male:

| | | |
|---|---|---|
| D4–P7a | 5 | Higashihama 5 |
| D4–P7c | 1 | Higashihama 1 |
| D4′–P7b | 4 | Higashihama 4 |
| D4′–P7c | 6 | Higashihama 6 |
| D5–P7b | 7 | Higashihama 5, Muromi 1, Ujina 1 |
| D5–P7c | 3 | Higashihama 2, Ohta 1 |
| D6–P7b | 1 | Muromi 1 |
| D7–P7b | 1 | Momoji 1 |

Most of the specimens with P7 are combined with the B group of dactylus, but the combinations are diverse, without showing any trend of concentration.

**B. Variations in *C. petalura* Stimpson:**

Examinations were made as in the previous species on the cutting edge of dactylus, the distal margin of palm and its connection with dactylus, and the cutting edge of fixed finger.

*1. Variation of the cutting edge of dactylus.* There are two groups (A-B) and seven types (D1–D7) of variations (Fig. 6).

*A group.* This group consists of D1 and D2 and is characterized by the simple cutting edge of dactylus.

D1. The cutting edge is smooth on the whole length, or sometimes serrulate in the distal half. Generally the serrulation becomes indistinct toward the tip, as seen in the specimens Cat. Nos. 9021 and 9057.

D2. The proximal portion of the cutting edge swells out a little. The specimen Cat. No. 1017 may be included in this type, although the proximal half of the cutting edge is strangely marked with three irregular lobules (Fig. 8c).

*B group.* This is composed of five types D3, D4, D5, D6 and D7. The cutting edge bears a low but broad truncate tooth in the proximal half, which is furnished at the distal end with a small outgrowth. The distal half of cutting edge shows a wide range of variation.

D3. The cutting edge becomes concave in the distal half.

D4. The cutting edge is provided with two shallow concavities in the distal half.

D5. The two concavities are distinct. The distal one is broader than the proximal at the opening.

D6. The two distinct concavities are almost of the same width at the opening, and are nearly of the same depth.

D7. The two concavities are similar to D5, though in this type the proximal one is broader than the distal at the opening.

*2. Variation of palm.* The distal margin of palm and its connection with the fixed finger are variable. The variations are divisible into three major types (Fig. 7).

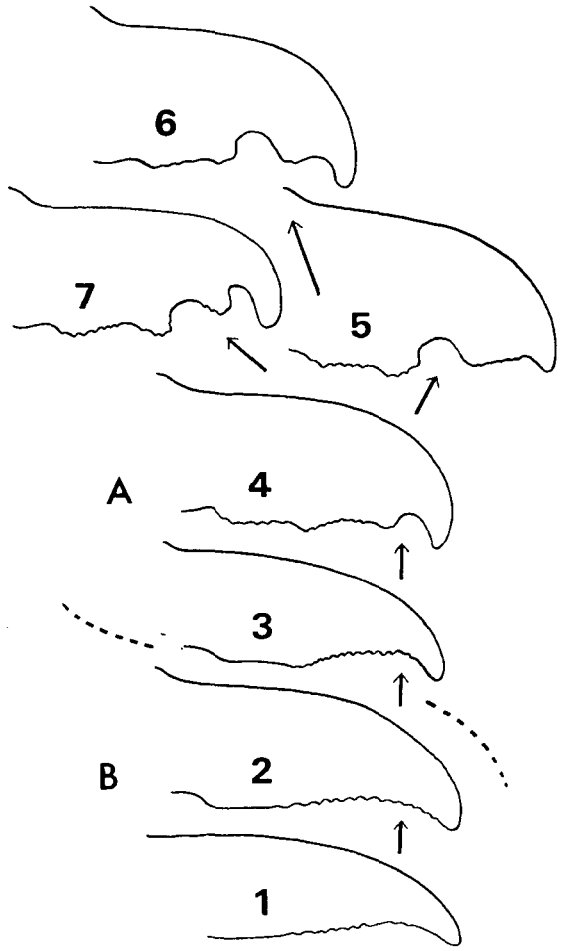


Fig. 6. Diagrams showing the variations of dactylus of the larger cheliped in *Callianassa petalura*. Seven types (D1–D7) are shown in two groups (A–B).

P1. The distal margin of palm is smooth and evenly connected with the fixed finger.

P2. The distal margin of palm is extended out a little over the outside of the proximal part of fixed finger. Consequently, the fixed finger comes just at or slightly above the lower edge of the distal margin of palm, when it is viewed from the outside.

a. The distal margin of palm is smooth and rounded at the lower edge.
b. The distal margin bears a simple outgrowth at the lower edge.
c. The outgrowth at the lower edge is broad but with a smooth margin.
d. The outgrowth is broad and serrulated along the margin.

P3. A prominent notch is formed on the distal margin of palm at the connecting point with the fixed finger.

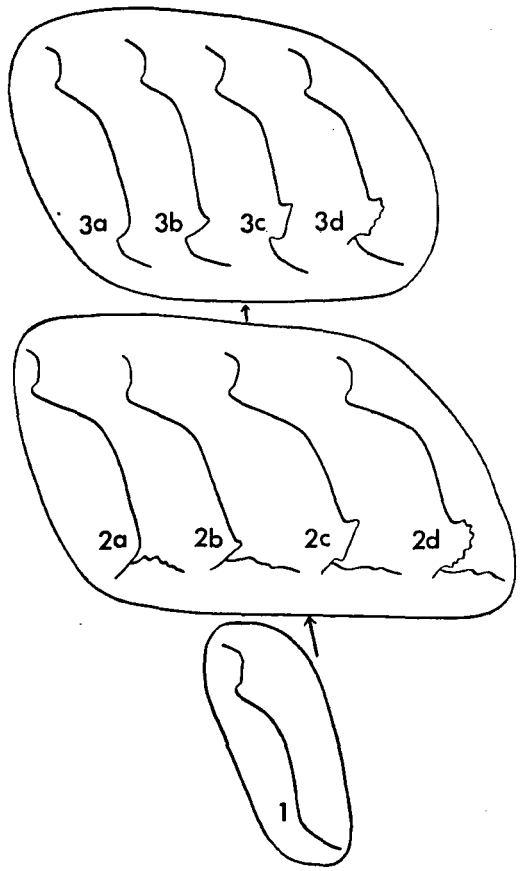


Fig. 7. Diagrams showing the variations of the distal part of palm of the larger cheliped in *Callianassa petalura*. Three types (P1–P3) are shown.

a. The distal margin of palm is smooth and is rounded at the upper edge of notch.
b. A simple outgrowth at the upper edge of notch.
c. The outgrowth is markedly broadened, but with a smooth margin.
d. The outgrowth is broad and serrulated along the margin.

The characteristics of the A group of dactylus are combined with the character-

istics P1 and P2 of palm, and the B group is related with P3. Specimens with D1 are sometimes accompanied with P3.

*3. Variation of the cutting edge of fixed finger.* The cutting edge of fixed finger is classified into the following three forms.

F1. The cutting edge is concave rather than straight, the serration is more prominent in the proximal part.

F2. Rather gentle downward bend at the distal one third or one fourth of the cutting edge.

F3. The cutting edge is smooth, but with an abrupt downward bend just near the tip.

*4. Combinations among the variations of dactylus, palm, and fixed finger.* Combinations of the palm (propodus) forms with the shapes of dactylus and fixed finger are checked on respective specimens as follows. For the combinations of the dactylus types with those of palm and fixed finger refer to Table 6.

1. Specimens with P1 (Fig. 8).

| Male: | | |
|---|---|---|
| Combination | Individual Number | Locality |
| D1–P1–F1 | 1 | Tsuyazaki 1 ind. |
| Female: | | |
| D1–P1–F1 | 3 | Tsuyazaki 2 ind., Shiraiwazaki 1 ind. |

The specimens of this form are very few. Of the four individuals one male and two females are young and only one female (Cat. No. 9094) is mature and ovigerous. It is, however, to be noted that the smaller cheliped of this ovigerous female seems to be regenerated larger cheliped.

2. Specimens with P2 (Pls. XIII–XIV and Fig. 8).

| Male: | | |
|---|---|---|
| D1–P2b–F1 | 1 | Tsuyazaki 1 |
| D1–P2d–F1 | 8 | Tsuyazaki 5, Akaiwa 1, Shiriki-shinai 2 |
| D1–P2d–F2 | 1 | Tsuyazaki 1 |
| D2–P2c–F1 | 1 | Tsuyazaki 1 |
| D2–P2d–F1 | 1 | Tsuyazaki 1 |
| D2–P2d–F2 | 1 | Tsuyazaki 1 |

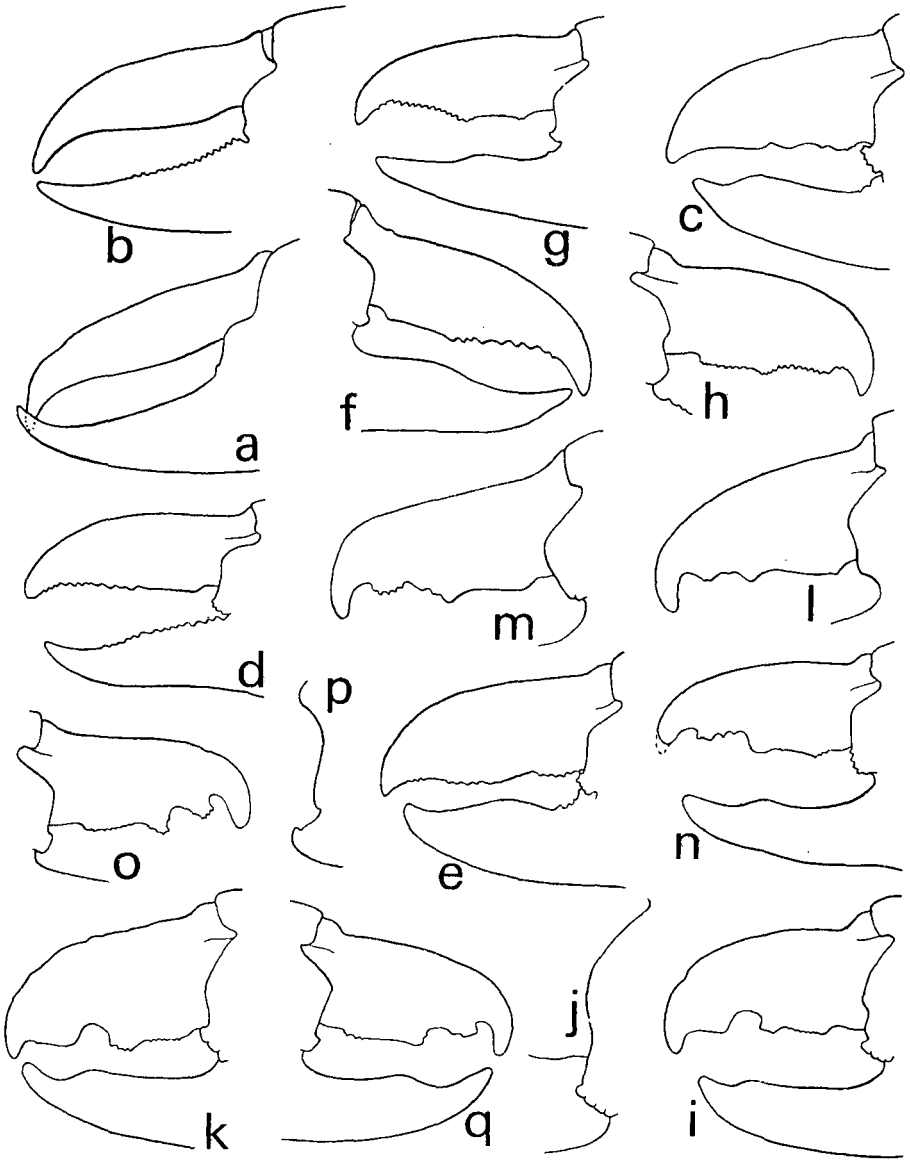


Fig. 8. Distal part of the larger cheliped of *Callianassa petalura*.
a: A female from Shiraiwazaki, Amakusa I., Cat. No. 9088, showing the form D1–P1–F1. b: A female from Tsuyazaki Beach, Fukuoka, Cat. No. 9011, D1–P2c–P1. c: A sample from Shiriki-shinai, Hokkaido, Cat. No. 1017, D1–P2d–F3. d: A male from Tsuyazaki Beach, Cat. No. 9045, D2–P2d–F1. e: A smaple from Shiriki-shinai, Cat. No. 1018, D2–P2d–F2. f: A female from Tsuyazaki Beach, Cat. No. 9078, D3–P3c–F2. g: A male from Tsuyazaki Beach, Cat. No. 9033, D3–P3c–F2. h: A male from Moheji, Hokkaido, Cat. No. 1001, D4–P3c–Fx. i: A male from Okinoshima I., Fukuoka Pref., Cat. No. 9001, D5–P3d–F3. j: Distal part of the palm of i. k: A male from Tsuyazaki Beach, Cat. No. 9029, D5–P3d–F3. l: A male from Tsuyazaki Beach, Cat. No. 9039, D6–P3a–F3. m: A male from Tsuyazaki Beach, Cat. No. 9030, D6–P3b–F3. n: A male from Tsuyazaki Beach, Cat. No. 9060, D6–P3d–F3. o: A male from Tsuyazaki Beach, Cat. No. 9024, D7–P3c–F3. p: Distal part of the palm of o. q: A male from Tsuyazaki Beach, Cat. No. 9034, D7–P3c–F3.

| | | |
|---|---|---|
| Female: | | |
| D1–P2a–F1 | 1 | Tsuyazaki 1 |
| D1–P2b–F1 | 3 | Tsuyazaki 3 |
| D1–P2c–F1 | 12 | Tsuyazaki 10, Oshima 1, Shiriki-shinai 1 |
| D1–P2d–F1 | 15 | Tsuyazaki 12, Oshima 3 |
| D1–P2d–F2 | 1 | Shimoda 1 |
| D2–P2a–F1 | 1 | Oshima 1 |
| D2–P2c–F1 | 1 | Amakusa 1 |
| D2–P2d–F1 | 2 | Tsuyazaki 2 |
| Sex underermined: | | |
| D1–P2d–F1 | 1 | Shiriki-shinai 1 |
| D1–P2d–F2 | 1 | Shiriki-shinai 1 |
| D1–P2d–F3 | 1 | Shiriki-shinai 1 |

Among these combinations shown above, D1–P2d–F1 is common in the male, while D1–P2c–F1 and D1–P2d–F1 are general in the female. Most females are included in the combinations D1–P2 and D2–P2.

3. Specimens with P3 (Pls. XIV–XV and Fig. 8).

| | | |
|---|---|---|
| Male: | | |
| D1–P3b–F1 | 1 | Tsuyazaki 1 |
| D1–P3c–F1 | 1 | Tsuyazaki 1 |
| D3–P3c–F1 | 1 | Tsuyazaki 1 |
| D3–P3c–F2 | 1 | Tsuyazaki 1 |
| D4–P3c–F3 | 2 | Tsuyazaki 2 |
| D4–P3c–Fx | 1 | Moheji 1 |
| D5–P3b–F3 | 1 | Akaiwa 1 |
| D5–P3d–F3 | 4 | Tsuyazaki 1, Okinoshima 1, Shimoda 2 |
| D6–P3a–F3 | 1 | Tsuyazaki 1 |
| Dx–P3a–F3 | 1 | Tsuyazaki 1 |
| D6–P3b–F3 | 1 | Tsuyazaki 1 |
| D6–P3c–F3 | 1 | Tsuyazaki 1 |
| D6–P3d–F3 | 2 | Tsuyazaki 2 |
| D7–P3c–F3 | 13 | Tsuyazaki 11, Oshima 2 |
| D7–P3d–F3 | 2 | Shiriki-shinai 2 |
| Female: | | |
| D3–P3c–F2 | 1 | Tsuyazaki 1 |
| Sex undetermined: | | |
| D1–P3d–F3 | 1 | Shiriki-shinai 1 |

The specimens with P3 are restricted to the males with the dactylus of the types D1, D3, D4, D6 and D7. Only a female Cat. No. 9078 is exceptional. There is a tendency that D1 is combined with F1, and D4 ,D5, D6 and D7 are related with F3. Throughout these combinations, D7–P3c–F3 is the commonest. It is noteworthy

that the specimens from Tsuyazaki Beach are very variable in the combination of characteristics of the larger cheliped.

## IV. Revision of Japanese Callianassids

The following are the reviews of the Callianassids previously reported from Japan basing on the morphological variations of the larger cheliped described above in detail.

STIMPSON (1860) described *C. petalura*, both male and female, but he payed no attention to the sexual differentiation in the species. The following references seem to show that his species represents certainly one of the two Japanese species, namely *C. petalura*.

*1.* The type locality, Shimoda, is situated near the tip of the Izu Peninsula and faces the open sea of Sagami Bay. The coast is mostly rocky and water is very clear. Such circumstances are much different from those of the other species living in Tokyo Bay or the likes. The similar specimens treated in the present paper were collected abundantly at Tsuyazaki, Fukuoka. In addition to the morphological similarity, this living circumstances resemble closely those of Shimoda, the type locality of the STIMPSON's species. For these reasons, the specimens from Tsuyazaki were identified with *C. petalura*.

*2.* He described about the larger cheliped as "pedes primi paris foeminae eis maris similes;" and "palma quam carpus non brevior, ..." The first definition quoted above may show that the dactylus of STIMPSON's species is applicable to the A group of *C. japonica* or *C. petalura*. However, the second feature restricts his species to *C. petalura*, because among all the specimens with the characteristic of A group in the present material, only some of *C. petalura* bear the palm which is not shorter than the carpus (Table 9).

*3.* STIMPSON wrote "*Foeminae* long 1.57 (=39.9 mm); carapacis, 0.36 (=9.1 mm); long. carpi manus dactylique junctorum chelipedis majoris, 0.70 poll (=17.8)." The specimens with the body length of 38.0–41.0 mm in the present material can be referred to STIMPSON's dimensions of the carapace length and the length of the larger cheliped from carpus to dactylus (Tables 7 and 8).

Of *C. japonica*, the males Cat. Nos. 7015, 9037 and 9059 well comform to STIMPSON's dimensions, but the shape of their larger cheliped does not agree with that of his specimens, and in the female the cheliped length is much smaller than that given in STIMPSON's dimensions. In *C. petalura*, however, the male cheliped is much longer than in STIMPSON's specimens, while in the females Cat. Nos. 3002 and 9048 the cheliped length is agreeable to STIMPSON's dimensions. For those reasons, it is supposed that STIMPSON's measurements were made on the female of *C. petalura*, but not on *C. japonica*.

MAKAROV (1935) reported the male of *C. gigas* Dana var. *japonica* from Peter the Great Bay in the Sea of Japan. Later he (1938) revised the name of his specimens to *C. gigas* var. *eoa* nov. It is seen from his figure of the larger cheliped that his species is nothing but a male of *C. petalura* with the larger cheliped of form D6–P3a–F1. This form is, however, not represented in the present material of *C. petalura.*

ORTMANN (1891) described a Callianassid female from Tokyo Bay as a variety of *C. subterranea.* His description is simple and insufficient to discriminate his species from others, but his figure (Pl. 1, Fig. 10a) seems to show some specific characteristics. The characteristics shown in his figure may be summed up as follows.

*1.* The proximal tooth on the lower margin of merus is convex rather than straight and serrulate on its lower margin, and never protruded distally so much as in *C. petalura.*

*2.* The upper margin of merus is crenulate, unlike that of *C. petalura.*

*3.* The carpus is broad and almost as long as wide.

*4.* The cutting edge of dactylus assumes the type D2 of *C. japonica*, although the exact feature of the distal margin of palm cannot be referred to as the part is obscurely drawn.

The characteristics mentioned above are seemingly attributable to the second species of the Japanese Callianassids *C. japonica*, but not to the STIMPSON's species.

BOUVIER (1901) reported two new species, *C. californiensis* var *japonica* and *C. harmandi.* The type specimens of *C. californiensis* var. *japonica* is mentioned as the female. According to his description it is supposed that the dactylus of larger cheliped might be of the type D3 of B group of *C. japonica*, as the female of *C. japonica* will never take any of other types D4, D4′, D5, D6 and D7. However, DE MAN (1928a) corrected the sex of the type specimen to the male from the female, when he gave a revision of *C. californiensis* var. *japonica.* In *C. harmandi* the dactylus of larger cheliped might be of the form D12 or D13 of C group.

Concerning the proportion of the palm to the carpus BOUVIER described on *C. harmandi*, *C. japonica* and *C. petalura* in the key as "Carpe avant à peu prés la longieur de la portion palmaire." and on *C. californiensis* var. *japonica* as "Carpe franchement plus long que la portion palmaire et ....." However, those definitions are not always correctly applicable seen in the following reference.

To apply the above-mentioned definitions easily to the specimens of the present material, the proportion of the palm to the carpus is classified for convenience' sake into $\alpha$, $\beta$ and $\gamma$ types; the palm is longer than the carpus in $\alpha$ type, the palm is as long as the carpus in $\beta$ type and the palm is shorter than the carpus in $\gamma$ type. The whole specimens of *C. japonica* and *C. petalura* in the present material were checked according to this classification (Table 9). In *C. japonica* the specimens of A and B groups in the morphology of dactylus tend to bear $\gamma$ type, on the other hand those of C group collected at other localities than Amakusa consist of 19 $\alpha$ type and 1 $\beta$

type, while those collected from Amakusa are composed of 7 $\alpha$ type, 11 $\beta$ type and 37 $\gamma$ type. In *C. petalura* the specimens of A group consists of 12 $\alpha$ type, 9 $\beta$ type and 34 $\gamma$ type, while those of B group are 1 $\alpha$ type and 1 $\beta$ type.

BOUVIER framed a good definition for his *C. californiensis* var. *japonica*, but the definition does not always apply to his *C. harmandi* and to the specimens of A group of *C. petalura* either. The specimens of B group of *C. petalura* never follow the BOUVIER's definition, the palm is much longer than the carpus in them.

BOUVIER shows the measurement data of *C. harmandi* on sexually undetermined specimens; the body length is 30.0 mm, the carapace 6.7 mm and chela 7.5 mm. In the present material only the male Cat. No. 9187 is found situated very close to BOUVIER's dimensions. Another male Cat. No. 9056 is also close to his dimensions, but its larger cheliped shows the form D4–P6a which is not included in the forms taken by BOUVIER's *C. harmandi*.

BALSS (1914) mentioned on *C. subterranea* var. *japonica* from the province of Bingo. His measurement datum of the larger cheliped shows that in the larger specimen the carpus length is 8.1 mm, the carpus height 6.8 mm and the chela length 9.0 mm, while in the smaller specimen the carpus length is 4.0 mm, the carpus height 3.0 mm and the chela length 6.0 mm. This datum is very helpful to review BALSS' specimens. His larger specimen is related closely with the males Cat. Nos. 9062, 9069 and 9165 of *C. japonica* with the dactylus of B group. On the contrary the smaller specimen is similar to the female Cat. No. 9063 and the males Cat. Nos. 9083 and 9090 of *C. petalura*; the female with the dactylus of B group and the males with the dactylus of A group. In short, it is supposed that BALSS' specimens consist of *C. japonica* and *C. petalura*. It must be remembered, however, that BALSS himself regarded *C. petalura* as synonymous with *C. japonica*.

PARISI (1917) described *C. harmandi*. His figure of the larger cheliped shows the form D14–P5c of *C. japonica*.

DE MAN (1928a) revised the Japanese Callianassids. According to his revision, the male of *C. harmandi* is characterized by larger cheliped of the form D11 or D12–P5c, the male of *C. californiensis* var. *japonica* by the larger cheliped of D5–P7b, and the female of *C. japonica* by the form D2 or D3–P2b.

He examined the type specimen of *C. californiensis* var. *japonica*, and defined it as a male, though BOUVIER (1901) described it as a female. It is very likely that the type is a male, because DE MAN's figure (Pl. 4, fig. 9) of the original specimen shows the larger cheliped of the form D5–P7b which is only found in the male.

He described the carpus of the larger cheliped on page 14 as "Differently from *Call. japonica*, in which the upper border appears longer than the breadth of the joint, in *Call. harmandi* it is *shorter* than the breadth." DE MAN further described on *C. californiensis* var. *japonica* on page 19 as "The upper border of the carpus is 7,25 mm.

long; the width being 6,8 mm., this joint appears much *broader* in proportion to its length than in the male of *Call. japonica* and ..." However, the proportions are not always agreeable to DE MAN's definition. In most specimens attributed to his *C. harmandi* and with the dactylus of C group, the upper margin of the carpus appears shorter than the height of the joint. However, in some of such specimens the upper margin may be longer than the height of the joint as in specimens Cat. Nos. 9060, 9089, 9091, 9095, 9103, 9124, 9126, 9138, 9142, 9146, 9163, 9164, 9181, 9183 and 9186, or the upper margin may be equal to the height of the joint as in specimens Cat. Nos. 9047, 9061, 9068, 9081, 9086, 9088, 9100, 9116, 9130, 9132, 9136, 9148, 9149, 9160, 9169, 9170, 9176, 9179, 9189 and 9191.

In the present material, the specimens attributed to *C. japonica* and with the larger cheliped of the forms D1 and D2 follow DE MAN's definition in the above-mentioned proportion. The specimens with the dactylus of B group, namely the individuals called by the name of *C. californiensis* var. *japonica*, generally agree with DE MAN's definition, too, but in some of them carpus may be as long as broad as in specimens Cat. Nos. 3002, 7009, 7022, 9185 and 9196, or broader than long as in specimens Cat. Nos. 1001, 7016, 7027, 9021 and 9049.

Concerning the proportion of the fixed finger to the palm, DE MAN (1928a, p. 15) described on *C. harmandi* that "This finger (=fixed finger) is distinctly *shorter*, but in *Call. californiensis* DANA var. *japonica* BOUV. distinctly *longer* than the palm between the basal notch and the carpal articulation." However, it is observed that the specimens with the dactylus of B group often include such exceptions, in which the fixed finger is shorter than the palm.

YOKOYA (1930) wrote about *C. japonica*, though he treated *C. japonica* as a synonym of *C. petalura*. As his specimens came from the river estuary or from the sandy seaweed bed, it is very probable that his species is *C. japonica*. YOKOYA (1939) adopted in his description the name of *C. petalura* instead of *C. japonica*.

YÜ (1931) wrote on three species of the genus *Callianassa*. According to the present observations, his *C. harmandi* is provided with the larger cheliped of the form D11–P4a or P4b, his *C. californiensis* var. *japonica* with the cheliped of D4–P7a, and his *C. japonica* is of the form D3–P2a.

MIYAZAKI (1937) described on the hollow of *C. japonica*. He note is agreeable to the holes of *C. japonica* observed at the estuary of the Muromi River.

MAKAROV (1938) wrote about *C. harmandi*, *C. japonica* and *C. californiensis* var. *bouvieri*. Reference to their forms of the dactylus is as follows; his *C. harmandi* belongs to the group with the larger cheliped of the form D14–P5b, his *C. japonica* to the group of D3–P2a and his *C. californiensis* var. *bouvieri* to D4–P7a or P7b. In the result *C. californiensis* var. *bouvieri* is synonymous with BOUVIER's *C. californiensis* var. *japonica*.

NAKAZAWA (1947) described on *C. harmandi* and *C. japonica*. However, their

figures are insufficient to descriminate respective species.

UTINOMI (1956) illustrates *C. japonica* as *C. harmandi*.

KAMITA (1957) figured the larger cheliped of a male *C. subterranea japonica*. His figure is surely of the form D5–P7b and is different from ORTMANN's species, but it is rather related closely to Bouvier's *C. californiensis* var. *japonica*.

## V. Conclusions

1. Although the validity of *C. petalura* was questioned by BORRADAILE (1903, p. 546) and DE MAN (1928b, p. 19), *C. petalura* is to be accepted as a distinct species.
2. Several species of the genus *Callianassa* reported from Japan are grouped into two species:

1. *Callianassa petalura* STIMPSON, 1860
   = *C. gigas* var. *japonica* MAKAROV, 1935
   = *C. gigas* var. *eoa* MAKAROV, 1938
2. *Callianassa japonica* ORTMANN, 1891
   = *C. harmandi* BOUVIER, 1901
   = *C. californiensis* var. *japonica* BOUVIER, 1901
   = *C. californiensis* var. *bouvieri* MAKAROV, 1938

*C. gigas* var. *japonica* is synonymous with *C. petalura*. STIMPSON described on the female type specimen, but MAKAROV on the male. The second species, *C. japonica*, has three synonyms: *C. harmandi*, *C. californiensis* var. *japonica* and *C. californiensis* var. *bouvieri*. ORTMANN showed the female type specimen, but BOUVIER and MAKAROV the male.

3. *Bouvier* (1901) described *C. californiensis* var. *japonica* on the female. However, as DE MAN (1928a) pointed out, it is sure that BOUVIER's type specimen is male.
4. Variability of the larger cheliped is prominent on the cutting edge of the dactylus, the distal margin of the palm and in its connection to the fixed finger. As far as the variation of the dactylus is concerned, *C. japonica* bears the forms of ORTMANN's *C. japonica*, BOUVIER's *C. californiensis* var. *japonica* and BOUVIER's *C. harmandi*, while *C. petalura* bears the forms of STIMPSON's *C. petalura* and MAKAROV's *C. gigas* var. *japonica*.
5. The above-mentioned variations of the larger cheliped are applied to respectively described species as follows:

| | |
|---|---|
| *C. japonica* ORTMANN, 1891 | D2 |
| *C. harmandi* BOUVIER, 1901 | D13 or D14 |
| *C. californiensis* var. *japonica* BOUVIER, 1901 | D3 |
| *C. californiensis* var. *japonica*, DE MAN, 1928 | D5–7b |
| *C. californiensis* var. *bouvieri* MAKAROV, 1938 | D4–P7a or P7b |
| *C. petalura* STIMPSON, 1860 | D2 |
| *C. gigas* var. *japonica* MAKAROV, 1935 | D6–P3a–F1 |

6. Some described species are defined improperly. BALSS (1914) reported *C. subterranea* var. *japonica* with measurement of two specimens, the larger one seemingly belongs to *C. californiensis* var. *japonica* for the form of the dactylus, while the smaller one to *C. petalura*. KAMITA (1957) explained *C. subterranea japonica* by the form of the dactylus of *C. californiensis* var. *japonica*.

## VI. Specific descriptions proposed

### A. *Callianassa japonica* ORTMANN, 1891

*Callianassa subterranea* (MONTAGU) var. *japonica* ORTMANN, 1891, p. 56, pl. 1, fig. 10a; BOUVIER, 1901, pp. 332–334; BALSS, 1914, p. 91; YOKOYA, 1930, p. 543; MIYAZAKI, 1936, pp. 317–320, fig. 1–2; NAKAZAWA, 1927, p. 1038, fig. 1999.

*Callianassa subterranea japonica*: KAMITA, 1957, pp. 107–109, fig. 49.

*Callianassa* (*Trypaea*) *japonica*: BORRADAILE, 1903, p. 546; DE MAN, 1928a, pp. 19–22, pl. 5, figs. 10–10 1; DE MAN, 1928b, pp. 27, 93, 105–106; YÜ, 1931, pp. 95–96, fig. 5; MAKAROV, 1938, pp. 69–71, fig. 25.

*Callianassa japonica*: NAKAZAWA and KUBO, 1957, p. 754, fig. 2174; SAKAI, 1964; MIYAKE, 1965, p. 633, fig. 1037.

*Callianassa Harmandi* BOUVIER, 1901, pp. 332–334; BORRADAILE, 1903, p. 546.

*Callianassa harmandi*: NAKAZAWA and KUBO, 1947, p. 754, fig. 2173; UTINOMI, 1956, p. 63, pl. 32, fig. 2.

*Callianassa hermandi*: NAKAZAWA, 1927, p. 1039, fig. 2000.

*Callianassa* (*Trypaea*) *Harmandi*: PARISI, 1917, p. 24, fig. 7; DE MAN, 1928a, pp. 13–15, pl. 3, figs. 6–6j; DE MAN, 1928b, pp. 27, 102–103; YÜ, 1931, pp. 92–93, fig. 3.

*Callianassa* (*Tyrpaea*) *harmandi*: MAKAROV, 1938, pp. 66–67, fig. 22–23.

*Callianassa californiensis* var. *japonica* BOUVIER, 1901, pp. 332–334.

*Callianassa* (*Trypaea*) *californiensis* DANA var. *japonica*: DE MAN, 1928a, pp. 18–19, pl. 4, figs. 9–9e; DE MAN, 1928b, pp. 27, 93, 105; YÜ, 1931, p. 94, fig. 4.

*Callianassa* (*Trypaea*) *californiensis* DANA var. *bouvieri* MAKAROV, 1938, pp. 71–72, fig. 26.

*Description.*- The cervical groove lies near the posterior one third of the carapace. The inner surface of the ischium of the third maxilliped bears a vertical row of spinules numbering 17 on an avarage.

This species is classified into three groups by the form of the dactylus of the larger cheliped (Fig. 2). A-group is represented by ORTMANN's *C. japonica*, B-group is by BOUVIER's *C. californiensis* var. *japonica* and C-group is by BOUVIER's *C. harmandi*.

In the form of *C. japonica* (A-group) the proximal tooth on the lower margin of the merus is less developed and simple, especially in the young stage. The tooth is formed similarly in both male and female. The merus is about as long as the ischium, but distinctly shorter than the carpus. The carpus is longer than high and longer than the palm.

The forms of *C. californiensis* var. *japonica* (B-group) and *C. harmandi* (C-group) are characterized by that the proximal tooth of the merus is convex rather than straight on its lower margin. The merus is a little longer than the ischium. In the former, the carpus is a little shorter than or often equal to the merus, longer than the palm, and usually longer than high, but sometimes higher than long. Of the latter the smaller

specimens from Higashihama Beach show the character that the carpus is about as long as or a little longer than the merus, while in the full-grown ones the carpus is as long as or a little shorter than the merus. The proportion of the carpus height to the length and the relation between the carpus and the propodus are indefinite.

Other specific characteristics are given as follows: The upper margin of the ischium is smooth and proximally terminates with a subacute tooth. The upper margin of the merus is crenulate, and that of the carpus is twisted or curved inward more strongly at the proximal part than at the distal.

The habitat is restricted to the tidal zone of the protected coastal area around Japan, and the hollow is cross-shaped.

## B. *Callianassa patalura* STIMPSON, 1860

*Callianassa petalura* STIMPSON, 1860, p. 23; BOUVIER, 1901, pp. 332–334; YOKOYA, 1939, p. 227–278; SAKAI, 1964; MIYAKE, 1965, p. 633, fig. 1036.
*Callianassa* (*Trypaea*) *petalura*: BORRADAILE, 1903, p. 546; DE MAN 1928b, pp. 28, 115.
*Callianassa* (*Trypaea*) *gigas* DANA var. *japonica* MAKAROV, 1935, pp. 323–324, fig. 4.
*Callianassa* (*Trypaea*) *gigas* var. *eoa* MAKAROV, 1938, pp. 67–69, fig. 24.
*Callianassa subterranea* var. *japonica* ORTMANN: BALSS, 1914, p. 91.
*Callianassa subterranea japonica*: KIKUCHI, 1932, p. 7.

*Description.*- The cervical groove is situated at about posterior one fourth of of the carapace. The ischium of the third maxilliped bears inside a vertical row of spinules. These spinules are short and sharp, numbering 13–30, most frequently 19–25.

On the larger cheliped, the upper margin of the ischium is usually denticulate in roughly the proximal half. The denticles become more distinct proximally, but they may often be inconspicuous or quite missing in smaller specimens. The merus is slightly longer than the ischium. The proximal tooth of the merus is protruded forward into a pointed tip. The upper margin of the carpus runs parallel with the lower margin.

Variations of the dactylus of larger cheliped are classified into two groups (Fig. 4). A-group is represented by STIMPSON's *C. petalura* and B-group is by MAKAROV's *C. californiensis* var. *japonica*. In A-group the carpus is longer than the merus and longer than high, the proportion of the palm to the carpus is indefinite. In B-group the carpus is usually longer than the merus, but it may often be equal to or shorter than the merus. The carpus is longer than high, and shorter than the palm.

This species is found burrowing on the sandy-beach facing the open-sea or the likes.

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Table 1. Material of *C. japonica* examined; locality, date and collector's name.

| Cat. No. of Specimen | Individual Number | Locality | Date of Collection | Collector's Name |
|---|---|---|---|---|
| 1001–1003 | 1♂, 2♀♀ | Funka Bay, Hokkaido | Mar. 11, '63 | Kazuo Oshima |
| 3001 | 1♂ | Kanazawa-hakkei, Tokyo Bay | Aug. 7, '60 | K. Sakai |
| 3002–3004 | 1♂, 2♀♀ | ——— " ——— | Jan. 5, '61 | K. Sakai |
| 3005–3007 | 3 ovig. ♀♀ | Kisarazu and Aohori, Tokyo Bay | July 30, '57<br>Jun. 21, '60 | Minoru Katada |
| 3008 | 1♀ | Zaimokuza Beach, Kamakura, Sagami Bay | Dec. 31, '60 | K. Sakai |
| 7001 | 1♂ | Sami, Okayama | Aug. '34 | S. Miyake |
| 7002–7014 | 7♂♂ (7 with Bop.)<br>6♀♀ (5 with Bop.) | Ujina, Hiroshima | Oct. 19, '58 | Akio Taki |
| 7015–7019<br>7021–7027 | 7♂♂, 5♀♀ | Estuary of Ohta River, Hiroshima | Apr. 4, '62 | Reichiro Hirota |
| 9001–9002 | 2♂♂ | Okinoshima I., Fukuoka Pref. | May 19–29, '33 | Ohshima, Ikeda and Yasumoto |
| 9003–9009 | 2♂♂, 3♀♀, 2 ovig. ♀♀ | Najima Beach, Hakata Bay, Fukuoka | May 5, '54 | S. Miyake |
| 9010 | 1♂ | ——— " ——— | May 2, '60 | K. Sakai |
| 9011 | 1♂ | ——— " ——— | May 8, '60 | K. Sakai |
| 9012–9013 | 1♂, 1♀ | ——— " ——— | May 11, '60 | K. Sakai |
| 9014 | 1♀ (with Bop.) | ——— " ——— | Sept. 23, '60 | K. Sakai |
| 9015 | 1♀ | Estuary of Tatara River, east of Najima Beach | Jun. 17, '59 | Taki and Ono |
| 9016 | 1♀ | ——— " ——— | May 12, '63 | K. Sakai |
| 9017–9021 | 2♂♂, 2♀♀, 1 ovig. ♀ | Momoji Beach, Hakata Bay | May 30, '58 | A school teacher |
| 9022–9034 | 7♂♂, 5♀♀, 1 ovig. ♀ | Estuary of Muromi River, west of Momoji Beach | Apr. 7, '63 | Sakai, Baba and Miya |
| 9035–9041 | 12♂♂ (1 with Bop.), | | Apr. 9, '63 | K. Sakai |
| 9043–9052 | 4♀♀, 1 ovig. ♀ | ——— " ——— | | |
| 9053 | 1♂ | ——— " ——— | July 22, '63 | K. Sakai |
| 9054 | 1♂ | Arao, Ariake Bay | Jun. 4, '57 | School students |
| 9055–9186 | 97♂♂, 17♀♀, 18 ovig. ♀♀ | Higashihama Beach, Amakusa I., Kumamoto Pref. | Apr. 23–25, '63 | K. Sakai |
| 9187–9205 | 13♂♂, 6♀♀ | ——— " ——— | Apr. 29, '64 | Y. Miya |

Table 2. Material of *C. petalura* examined; locality, date and collector's name.

| Cat. No. of Specimen | Individual Number | Locality | Date of Collection | Collector's Name |
|---|---|---|---|---|
| 1001 | 1♂ | Moheji, Hakodate, Hokkaido | Jun 18, '54 | Eijiro NIYAMA |
| 1002–1003 | 2♂♂ | Shiriki-shinai, Hokkaido | May 20, '55 | Minoru IMAJIMA |
| 1005–1019 | 5♂♂, 2♀♀, 4 ovig. ♀♀, 4 s.u. | ———— " ———— | Aug. 3, '59 | M. IMAJIMA |
| 2001 | 1♂ | Tobishima I. Yamagata Pref. | Aug. '50 | Shoichiro SUZUKI |
| 3001–3004 | 2♂♂, 1♀, 1 ovig. ♀ | Shirahama Beach, Shimoda, Izu Peninsula | Apr. 22, '64 | Tadayoshi TOCHIGI |
| 9001 | 1♂ | Okinoshima I., Fukuoka Pref. | May 19–29, '33 | OHSHIMA, IKEDA and YASUMOTO |
| 9002 | 1 ovig. ♀ | Oshima I., Fukuoka Pref. | Jun 13, '56 | S. MIYAKE |
| 9003–9009 | 2♂♂, 1♀, 4 ovig. ♀♀ | ———— " ———— | Sept. 18, '57 | Yoshinori MOTOMATSU |
| 9010–9011 | 1♂, 1♀ | Tsuyazaki Beach, Fukuoka Pref. | Jun. 13, '60 | K. SAKAI |
| 9012–9049 | 19♂♂, 17♀♀, 2 ovig. ♀♀ | ————" ———— | Apr. 30, '61 | K. SAKAI |
| 9050–9075 | 12♂♂, 4♀♀, 10 ovig. ♀♀ | ———— " ———— | Jun. 22, '62 | K. SAKAI |
| 9076–9086 | 8♂♂, 3♀♀ | ———— " ———— | Apr. 26, '63 | K. SAKAI |
| 9087 | 1 ovig. ♀ | Amakusa, Kumamoto Pref. | Aug. 21, '43 | S. MIYAKE |
| 9088 | 1♀ | Shiraiwazaki, Amakusa I. | Mar. 29, '53 | S. MIYAKE |
| 9089–9090 | 2♂♂ | Akaiwa, Amakusa I. | Mar. 31, '53 | MIYAKE and SUMIKAWA |
| 9091–9093 | 3♂♂ | Tsujishima I., Amakusa | Apr. 26, '63 | K. SAKAI |

Table 3. Measurements of *C. japonica*, body length, length of larger cheliped and dimension of its respective parts; merus length, carpus length and height, palm length and dactylus length.

| Cat. No. of Specimen | Sex | Body Length mm | Larger Cheliped | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Side | Total Leng. mm | Merus Leng. mm | Carpus Leng. mm | Carpus Ht. mm | Palm Leng. mm | Dactylus Leng. mm |
| 1001 | ♂ | — | L | 46.0 | 13.2 | 14.2 | 15.0 | 14.0 | 10.5 |
| 1002 | ♀ | — | R | — | 6.3 | 7.7 | 6.3 | 5.8 | 5.0 |
| 1003 | ♀ | — | R | — | 6.4 | 7.8 | 6.3 | 5.8 | 5.5 |
| 3001 | ♂ | 57.0 | L | 43.0 | 11.5 | 10.5 | 12.0 | 11.8 | 8.0 |
| 3002 | ♂ | 40.5 | R | 28.0 | 6.8 | 6.8 | 6.8 | 6.0 | 5.4 |
| 3003 | ♀ | — | L | 30.5 | 7.1 | 8.0 | 7.0 | 5.7 | 6.5 |
| 3004 | ♀ | — | L | 28.0 | 6.0 | 7.2 | 6.2 | 5.8 | 5.4 |
| 3005 | ♀ ovig. | 36.0 | — | — | — | — | — | — | — |
| 3006 | ♀ ovig. | 36.0 | — | — | — | — | — | — | — |
| 3007 | ♀ ovig. | — | — | — | — | — | — | — | — |
| 3008 | ♀ | 43.0 | L | 20.0 | 4.3 | 5.5 | 3.8 | 4.2 | 3.8 |
| 7001 | ♂ | 32.0 | L | 25.0 | 5.9 | 5.6 | 6.0 | 6.7 | 4.7 |
| 7002 | ♂ Bop. | 34.0 | R | — | — | — | — | — | — |
| 7003 | ♀ Bop. | — | R | — | — | — | — | — | — |
| 7004 | ♂ Bop. | 25.0 | R | 15.5 | 3.3 | 3.8 | 3.2 | 3.8 | 2.6 |
| 7005 | ♂ Bop. | 37.0 | L | 24.5 | 5.2 | 5.9 | 5.5 | 5.5 | 4.6 |
| 7006 | ♀ | 33.0 | R | — | — | — | — | — | — |
| 7007 | ♀ Bop. | 31.5 | R | — | — | — | — | — | — |
| 7008 | ♀ Bop. | 26.0 | R | 17.0 | 3.9 | 4.3 | 3.8 | 3.8 | 3.3 |
| 7009 | ♂ Bop. | 27.5 | R | 17.0 | 3.7 | 4.3 | 4.5 | 3.8 | 3.0 |
| 7010 | ♂ Bop. | 34.5 | L | 21.5 | 4.6 | 5.8 | 4.3 | 4.0 | 4.0 |
| 7011 | ♀ Bop. | 40.0 | L | 24.0 | 5.1 | 5.5 | 4.9 | 5.3 | 4.4 |
| 7012 | ♀ Bop. | 43.5 | L | 24.0 | 5.2 | 5.5 | 5.0 | 5.5 | 4.5 |
| 7013 | ♂ Bop. | 32.5 | R | 19.0 | 3.8 | 5.0 | 3.5 | 3.8 | 3.2 |
| 7014 | ♂ Bop. | 31.5 | L | 17.5 | 3.8 | 4.4 | 3.5 | 3.8 | 3.2 |
| 7015 | ♂ | 40.0 | R | 27.0 | 6.3 | 6.3 | 6.8 | 7.3 | 4.7 |
| 7016 | ♂ | 39.5 | L | 30.5 | 7.0 | 7.5 | 7.6 | 6.1 | 6.8 |
| 7017 | ♀ | — | L | 16.0 | 3.2 | 4.0 | 3.0 | 3.5 | 2.9 |
| 7018 | ♀ | 28.0 | L | 14.5 | 3.0 | 3.8 | 2.8 | 3.0 | 2.6 |
| 7019 | ♂ | 24.5 | R | 12.5 | 2.7 | 3.0 | 2.5 | 3.0 | 2.0 |
| 7021 | ♀ | 39.5 | L | 22.0 | 4.6 | 5.3 | 4.2 | 4.7 | 4.2 |
| 7022 | ♂ | 48.0 | L | 37.0 | 8.9 | 9.9 | 9.9 | 6.8 | 7.8 |
| 7023 | ♀ | 39.0 | R | 19.0 | 4.2 | 5.0 | 3.9 | 4.3 | 4.0 |
| 7024 | ♀ | 44.0 | L | 24.0 | 5.2 | 6.1 | 5.2 | 4.9 | 4.5 |
| 7025 | ♂ | 43.5 | R | 31.0 | 7.0 | 7.5 | 7.2 | 6.1 | 6.4 |
| 7026 | ♂ | 43.0 | R | 31.5 | 7.2 | 8.2 | 7.9 | 6.2 | 6.9 |
| 7027 | ♂ | 49.0 | R | 40.0 | 9.9 | 10.2 | 10.7 | 7.8 | 9.5 |

Table 3. (continued)

| Cat. No. of Specimen | Sex | Body Length mm | Side | Larger Cheliped | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Total Leng. mm | Merus Leng. mm | Carpus Leng. mm | Carpus Ht. mm | Palm Leng. mm | Dactylus Leng. mm |
| 9001 | ♂ | 38.0 | R | 30.0 | 7.3 | 7.3 | 8.0 | 8.0 | 6.1 |
| 9002 | ♂ | 32.0 | R | 24.5 | 5.9 | 5.7 | 6.2 | 6.2 | 4.8 |
| 9003 | ♀ | 43.0 | R | 22.0 | 4.9 | 5.6 | 4.5 | 4.8 | 4.0 |
| 9004 | ♀ | 44.0 | — | — | — | — | — | — | — |
| 9005 | ♀ | 28.5 | R | — | — | — | — | — | — |
| 9006 | ♀ ovig. | 40.5 | R | 20.0 | 4.3 | 5.0 | 3.9 | 3.9 | 3.2 |
| 9007 | ♂ | 48.0 | L | 37.0 | 9.0 | 8.4 | 9.3 | 8.9 | 7.7 |
| 9008 | ♂ | 40.5 | R | — | — | — | — | — | — |
| 9009 | ♀ ovig. | 38.0 | R | 20.0 | 4.0 | 5.0 | 3.7 | 4.1 | 3.9 |
| 9010 | ♂ | 29.5 | L | 16.5 | 3.3 | 4.2 | 3.3 | 3.2 | 3.0 |
| 9011 | ♂ | 28.0 | R | — | — | 4.2 | 2.2 | 2.2 | — |
| 9012 | ♀ | 36.0 | L | 18.0 | 3.9 | 4.5 | 3.7 | 3.8 | 3.2 |
| 9013 | ♂ | 34.0 | L | 25.0 | 5.6 | 5.6 | 5.8 | 6.3 | 3.9 |
| 9014 | ♀ Bop. | 29.0 | L | 14.0 | 2.9 | 3.9 | 2.2 | 2.7 | 2.4 |
| 9015 | ♀ | — | R | 26.5 | 5.8 | 6.2 | 5.5 | 5.5 | 5.1 |
| 9016 | ♀ | 50.0 | L | 25.0 | 5.0 | 7.2 | 4.4 | 4.8 | 4.7 |
| 9017 | ♂ | 44.0 | L | 35.0 | 8.1 | 7.8 | 8.2 | 8.9 | 5.9 |
| 9018 | ♀ | 51.5 | L | 26.0 | 6.0 | 6.3 | 5.7 | 5.8 | 5.0 |
| 9019 | ♀ ovig. | 48.5 | R | 24.0 | 5.0 | 6.0 | 4.8 | 5.1 | 4.2 |
| 9020 | ♀ | 36.0 | — | — | — | — | — | — | — |
| 9021 | ♂ | 53.0 | L | 42.0 | 10.0 | 10.4 | 10.6 | 8.3 | 8.2 |
| 9022 | ♂ | 21.5 | L | 10.5 | 2.5 | 3.0 | 2.2 | 2.9 | 1.9 |
| 9023 | ♀ ovig. | 47.0 | L | 26.0 | 5.3 | 6.6 | 4.8 | 5.0 | 4.9 |
| 9024 | ♀ | 55.0 | R | 28.0 | 6.5 | 6.9 | 6.0 | 6.4 | 5.1 |
| 9025 | ♀ | 50.0 | L | 25.1 | 5.5 | 6.3 | 5.1 | 5.3 | 5.1 |
| 9026 | ♀ | 48.0 | R | 25.0 | 5.5 | 6.1 | 5.1 | 5.4 | 4.8 |
| 9027 | ♀ | 45.5 | R | 23.0 | 5.1 | 5.9 | 4.9 | 5.0 | 4.1 |
| 9028 | ♂ | 58.0 | L | 42.0 | 11.0 | 10.0 | 11.5 | 10.8 | 8.2 |
| 9029 | ♂ | 36.0 | L | 24.0 | 5.7 | 5.4 | 5.8 | 6.5 | 4.2 |
| 9030 | ♂ | 52.0 | R | — | — | — | — | — | — |
| 9031 | ♀ | 40.0 | R | 21.0 | 4.3 | 5.5 | 4.4 | 4.7 | 4.1 |
| 9032 | ♂ | 56.0 | L | — | — | — | — | | — |
| 9033 | ♂ | — | L | 46.0 | 11.2 | 10.8 | 12.0 | 11.0 | — |
| 9034 | ♂ | — | L | 40.5 | 10.1 | 9.9 | 11.0 | 10.1 | 7.8 |
| 9035 | ♂ | 44.0 | R | 30.0 | 7.0 | 6.9 | 7.2 | 8.0 | 5.3 |
| 9036 | ♂ | 37.0 | R | 26.0 | 6.3 | 6.0 | 6.8 | 6.9 | 4.4 |
| 9037 | ♂ | 41.0 | L | 27.0 | 6.3 | 5.9 | 6.5 | 7.0 | 4.8 |
| 9038 | ♀ ovig. | 47.5 | L | 26.0 | 6.0 | 6.5 | 5.8 | 5.2 | 5.2 |

Table 3. (continued)

| Cat. No. of Specimen | Sex | Body Length mm | Larger Cheliped | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Side | Total Leng. mm | Merus Leng. mm | Carpus Leng. mm | Carpus Ht. mm | Palm Leng. mm | Dactylus Leng. mm |
| 9039 | ♂ | 40.0 | L | 26.5 | 6.4 | 5.9 | 6.5 | 7.0 | 4.5 |
| 9040 | ♂ | 39.5 | L | — | — | — | — | — | — |
| 9041 | ♂ | 56.0 | L | 33.0 | 7.0 | 9.5 | 6.8 | 5.9 | 5.9 |
| 9043 | ♀ | 45.0 | R | 23.0 | 4.8 | 6.6 | 3.9 | 4.1 | 3.8 |
| 9044 | ♀ | 46.0 | L | 24.0 | 4.9 | 6.0 | 4.8 | 4.9 | 4.5 |
| 9045 | ♀ | 38.0 | L | 19.0 | 4.1 | 5.1 | 3.9 | 4.0 | 3.3 |
| 9046 | ♂ | 40.0 | R | 24.0 | 5.4 | 6.8 | 5.8 | 4.8 | 4.8 |
| 9047 | ♂ | 35.0 | L | 22.5 | 5.3 | 5.1 | 5.1 | 6.0 | 3.8 |
| 9048 | ♂ | — | R | 41.0 | 10.0 | 10.0 | 11.0 | 10.0 | 8.0 |
| 9049 | ♂ | 56.0 | L | 45.5 | 11.6 | 11.4 | 11.5 | 9.4 | 9.8 |
| 9050 | ♂ | — | R | 43.0 | 11.0 | 10.5 | 11.6 | 11.0 | 8.5 |
| 9051 | ♂ Bop. | 49.0 | L | 26.0 | 5.7 | 6.1 | 5.7 | 5.9 | 4.7 |
| 9052 | ♀ | 28.0 | L | 15.0 | 3.1 | 4.9 | 2.9 | 3.0 | 2.7 |
| 9053 | ♂ | 52.0 | R | 40.0 | 10.0 | 10.9 | 10.0 | 7.5 | 8.8 |
| 9054 | ♂ | 25.0 | R | 21.0 | 5.0 | 4.8 | 5.1 | 5.3 | 3.5 |
| 9055 | ♂ | 35.5 | R | 28.0 | 6.7 | 7.8 | 6.9 | 5.0 | 5.5 |
| 9056 | ♂ | 30.0 | L | 21.0 | 4.8 | 6.0 | 4.9 | 3.8 | 4.2 |
| 9057 | ♂ | 24.5 | R | 21.5 | 5.0 | 5.8 | 5.5 | 4.0 | 4.2 |
| 9058 | ♀ | 31.0 | L | 16.0 | 3.4 | 4.4 | 3.1 | 3.1 | 3.1 |
| 9059 | ♂ | 34.0 | L | 23.5 | 5.2 | 7.0 | 5.1 | 4.0 | 4.2 |
| 9060 | ♂ | 31.0 | R | 22.0 | 5.1 | 5.7 | 5.2 | 5.2 | 3.8 |
| 9061 | ♂ | 28.0 | L | 22.0 | 5.2 | 5.2 | 5.2 | 5.1 | 4.3 |
| 9062 | ♂ | 35.0 | R | 29.0 | 6.9 | 8.0 | 7.1 | 5.1 | 6.0 |
| 9063 | ♀ ovig. | 32.0 | R | 15.0 | 3.1 | 4.2 | 3.2 | 3.0 | 2.9 |
| 9064 | ♂ | 35.0 | L | 30.5 | 7.0 | 7.9 | 7.1 | 5.1 | 6.2 |
| 9065 | ♂ | 36.0 | L | 30.5 | 7.1 | 8.2 | 7.5 | 5.5 | 6.5 |
| 9066 | ♂ | 25.5 | L | 20.0 | 4.9 | 5.3 | 4.9 | 3.9 | 4.4 |
| 9067 | ♀ ovig. | 28.5 | R | 15.0 | 3.0 | 4.1 | 2.9 | 3.0 | 2.8 |
| 9068 | ♂ | 30.5 | L | 24.0 | 5.7 | 5.8 | 5.8 | 5.8 | 4.1 |
| 9069 | ♂ | 36.5 | L | 29.0 | 6.8 | 8.0 | 7.1 | 4.8 | 5.9 |
| 9070 | ♂ | 38.0 | L | 31.0 | 7.8 | 8.6 | 7.9 | 5.5 | 6.8 |
| 9071 | ♂ | 38.0 | R | 32.5 | 7.5 | 9.0 | 7.8 | 5.8 | 6.7 |
| 9072 | ♀ | 31.0 | R | 14.5 | 3.2 | 3.9 | 3.0 | 3.1 | 2.9 |
| 9073 | ♂ | 37.0 | L | 27.2 | 6.7 | 7.5 | 7.0 | 4.9 | 5.5 |
| 9074 | ♀ | 29.5 | — | — | — | — | — | — | — |
| 9075 | ♀ ovig. | 30.0 | L | 14.0 | 3.0 | 4.1 | 2.9 | 3.0 | 2.9 |
| 9076 | ♂ | 34.0 | R | 27.0 | 6.6 | 6.8 | 6.9 | 6.1 | 4.9 |
| 9077 | ♂ | 31.0 | L | 24.5 | 6.0 | 6.0 | 6.1 | 5.9 | 4.8 |
| 9078 | ♀ ovig. | 32.0 | R | 16.0 | 3.2 | 4.2 | 3.1 | 3.0 | 3.0 |
| 9079 | ♂ | 36.0 | L | 33.5 | 7.8 | 8.2 | 8.0 | 6.2 | 6.9 |
| 9080 | ♀ ovig. | 29.5 | R | 13.5 | 3.0 | 3.8 | 2.8 | 2.5 | 2.2 |
| 9081 | ♂ | 27.0 | L | 20.0 | 4.7 | 4.8 | 4.8 | 4.6 | 3.4 |
| 9082 | ♂ | 32.0 | R | 25.0 | 5.8 | 6.0 | 6.3 | 5.8 | 4.1 |

Table 3. (continued)

| Cat. No. of Specimen | Sex | Body Length mm | Larger Cheliped | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Side | Total Leng. mm | Merus Leng. mm | Carpus Leng. mm | Carpus Ht. mm | Palm Leng. mm | Dactylus Leng. mm |
| 9083 | ♂ | 32.0 | R | 25.0 | 6.0 | 6.6 | 6.0 | 4.7 | 5.2 |
| 9084 | ♂ | 31.0 | R | 24.0 | 5.7 | 5.8 | 5.9 | 5.5 | 4.0 |
| 9085 | ♂ | 27.0 | L | 20.0 | 4.5 | 5.0 | 4.8 | 3.7 | 4.0 |
| 9086 | ♂ | 23.0 | R | 15.0 | 3.8 | 3.8 | 3.8 | 3.8 | 2.7 |
| 9087 | ♂ | 20.0 | L | 14.0 | 3.0 | 3.5 | 2.8 | 2.6 | 2.8 |
| 9088 | ♂ | 33.5 | L | 27.0 | 6.5 | 6.8 | 6.8 | 6.3 | 5.1 |
| 9089 | ♂ | — | R | 24.0 | 5.8 | 6.0 | 5.9 | 5.5 | 4.1 |
| 9090 | ♂ | 27.0 | L | 20.0 | 4.4 | 5.3 | 4.8 | 3.7 | 4.0 |
| 9091 | ♂ | 27.0 | R | 21.0 | 5.0 | 5.1 | 4.8 | 5.0 | 3.8 |
| 9092 | ♂ | 27.5 | L | 19.5 | 4.7 | 5.5 | 4.8 | 3.8 | 4.1 |
| 9093 | ♀ ovig. | 29.5 | L | 16.0 | 3.3 | 4.0 | 3.0 | 3.3 | 3.0 |
| 9094 | ♂ | 30.0 | R | 24.0 | 5.6 | 5.8 | 5.9 | 5.2 | 4.1 |
| 9095 | ♂ | 27.0 | R | 18.0 | 4.0 | 4.4 | 4.1 | 4.5 | 3.0 |
| 9096 | ♂ | 31.0 | R | 23.0 | 5.4 | 6.0 | 5.7 | 4.1 | 4.5 |
| 9097 | ♀ ovig. | 25.0 | L | 14.0 | 2.9 | 3.7 | 2.8 | 2.9 | 2.9 |
| 9098 | ♂ | 32.5 | L | 23.0 | 5.2 | 6.2 | 5.8 | 4.2 | 4.8 |
| 9099 | ♀ | 30.0 | L | 15.5 | 3.2 | 4.2 | 3.2 | 3.1 | 3.0 |
| 9100 | ♂ | 23.0 | R | 14.5 | 3.5 | 3.8 | 3.8 | 3.8 | 2.7 |
| 9101 | ♂ | 33.0 | L | 23.0 | 5.8 | 5.8 | 6.0 | 5.8 | 4.1 |
| 9102 | ♀ ovig. | 32.0 | R | — | — | — | — | — | — |
| 9103 | ♂ | 21.0 | R | 15.0 | 3.5 | 3.8 | 3.5 | 3.5 | 2.5 |
| 9104 | ♂ | 30.0 | R | 24.0 | 6.0 | 6.0 | 6.3 | 5.8 | 4.6 |
| 9105 | ♂ | 33.0 | L | 26.5 | 6.2 | 7.0 | 6.2 | 4.8 | 5.3 |
| 9106 | ♂ | 23.0 | R | 14.5 | 3.2 | 3.9 | 3.3 | 2.9 | 2.9 |
| 9107 | ♂ | 36.0 | L | 28.5 | 6.7 | 7.9 | 6.9 | 5.0 | 6.0 |
| 9108 | ♀ ovig. | — | L | 14.0 | 2.8 | 3.8 | 2.8 | 2.7 | 2.2 |
| 9109 | ♂ | 34.0 | R | 27.0 | 6.7 | 7.8 | 6.9 | 4.9 | 5.6 |
| 9110 | ♂ | 28.0 | L | 21.0 | 4.9 | 5.4 | 4.9 | 3.9 | 4.1 |
| 9111 | ♂ | 27.0 | R | 22.0 | 5.0 | 5.9 | 5.1 | 3.9 | 4.3 |
| 9112 | ♀ | 25.5 | L | 13.5 | 2.8 | 3.8 | 2.8 | 2.5 | 2.5 |
| 9113 | ♂ | 32.0 | L | 23.0 | 5.8 | 6.3 | 6.0 | 4.5 | 5.0 |
| 9114 | ♂ | 27.0 | R | 21.0 | 4.7 | 5.7 | 4.8 | 3.9 | 4.1 |
| 9115 | ♀ | 24.0 | L | 12.0 | 2.7 | 3.3 | 2.4 | 2.5 | 2.3 |
| 9116 | ♂ | 31.0 | R | 25.0 | 5.8 | 6.0 | 6.0 | 5.7 | 4.3 |
| 9117 | ♂ | 32.0 | R | 24.5 | 5.8 | 5.6 | 6.1 | 6.0 | 4.1 |
| 9118 | ♀ ovig. | 38.0 | R | 16.0 | 3.3 | 4.8 | 2.9 | 2.9 | 2.8 |
| 9119 | ♂ | 29.0 | R | 23.0 | 5.5 | 6.3 | 5.3 | 4.4 | 4.7 |
| 9120 | ♂ | 32.0 | L | 25.0 | 5.9 | 6.0 | 6.4 | 6.0 | 4.5 |
| 9121 | ♂ | 35.0 | L | 28.0 | 6.6 | 6.7 | 6.9 | 6.4 | 4.8 |
| 9122 | ♂ | 31.0 | L | 25.0 | 5.9 | 6.0 | 6.2 | 5.8 | 4.4 |
| 9123 | ♀ | 24.0 | R | 13.0 | 2.7 | 3.7 | 2.2 | 2.3 | 2.5 |
| 9124 | ♂ | 23.0 | L | 16.0 | 3.7 | 3.9 | 3.7 | 3.8 | 2.9 |
| 9125 | ♂ | 29.0 | R | 22.0 | 5.7 | 5.4 | 5.9 | 5.7 | 4.0 |
| 9126 | ♂ | 34.0 | R | 26.0 | 6.0 | 6.8 | 5.7 | 6.0 | 4.5 |

Table 3. (continued)

| Cat. No. of Specimen | Sex | Body Length mm | Larger Cheliped | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Side | Total Leng. mm | Merus Leng. mm | Carpus Leng. mm | Carpus Ht. mm | Palm Leng. mm | Dactylus Leng. mm |
| 9127 | ♂ | 32.0 | L | 26.0 | 5.9 | 7.2 | 6.1 | 4.5 | 5.2 |
| 9128 | ♀ | 22.5 | R | 13.5 | 2.9 | 3.5 | 2.6 | 2.8 | 2.6 |
| 9129 | ♀ | 26.0 | R | 12.0 | 2.8 | 3.5 | 2.2 | 2.3 | 2.4 |
| 9130 | ♂ | 32.0 | R | 25.0 | 5.9 | 6.2 | 6.2 | 5.9 | 4.7 |
| 9131 | ♂ | 19.0 | L | 13.0 | 2.9 | 3.4 | 2.9 | 2.6 | 2.6 |
| 9132 | ♂ | 27.0 | L | 19.5 | 4.7 | 4.9 | 4.9 | 4.8 | 3.3 |
| 9133 | ♀ | 20.0 | L | 21.0 | 2.1 | 2.9 | 2.0 | 2.0 | 2.1 |
| 9134 | ♀ ovig. | 29.0 | L | 15.0 | 3.0 | 4.1 | 2.8 | 2.8 | 2.8 |
| 9135 | ♂ | 22.0 | L | 16.0 | 3.4 | 4.1 | 3.3 | 3.0 | 3.0 |
| 9136 | ♂ | 24.0 | L | 17.0 | 3.9 | 4.1 | 4.1 | 4.1 | 3.0 |
| 9137 | ♀ ovig. | 28.0 | R | 14.0 | 3.0 | 3.9 | 2.5 | 2.7 | 2.7 |
| 9138 | ♂ | 28.0 | R | 20.5 | 4.9 | 5.2 | 5.1 | 4.9 | 3.7 |
| 9139 | ♂ | 19.0 | R | 16.0 | 3.1 | 4.2 | 3.2 | 2.9 | 2.9 |
| 9140 | ♀ ovig. | 25.5 | R | 13.0 | 2.8 | 3.4 | 2.5 | 2.5 | 2.3 |
| 9141 | ♀ ovig. | 25.0 | R | 15.0 | 3.2 | 4.0 | 2.9 | 2.9 | 2.9 |
| 9142 | ♂ | 23.0 | R | 16.0 | 3.7 | 3.9 | 3.8 | 3.9 | 2.7 |
| 9143 | ♀ | 16.0 | R | 8.0 | 1.7 | 2.2 | 1.6 | 1.5 | 1.4 |
| 9144 | ♂ | 24.0 | R | 18.0 | 4.1 | 5.0 | 4.2 | 3.7 | 3.6 |
| 9145 | ♂ | 30.0 | R | 24.0 | 5.5 | 5.8 | 5.9 | 5.8 | 4.0 |
| 9146 | ♂ | 27.0 | L | 20.0 | 5.0 | 5.1 | 5.0 | 4.9 | 3.8 |
| 9147 | ♂ | 29.0 | R | 24.0 | 5.5 | 6.3 | 5.8 | 4.2 | 4.8 |
| 9148 | ♂ | — | R | 26.0 | 6.1 | 6.8 | 6.8 | 6.0 | 4.8 |
| 9149 | ♂ | 25.0 | L | 19.0 | 4.1 | 4.3 | 4.3 | 4.5 | 3.1 |
| 9150 | ♂ | 26.0 | L | 21.0 | 4.6 | 5.4 | 4.8 | 3.8 | 4.0 |
| 9151 | ♂ | 27.0 | L | 20.0 | 4.9 | 5.0 | 5.1 | 4.8 | 4.0 |
| 9152 | ♂ | 25.0 | L | 19.0 | 4.2 | 5.0 | 4.5 | 3.6 | 3.9 |
| 9153 | ♀ ovig. | 28.0 | L | 15.0 | 2.9 | 3.9 | 2.8 | 2.8 | 2.7 |
| 9154 | ♂ | 18.0 | R | 11.0 | 2.3 | 3.0 | 2.5 | 2.4 | 1.8 |
| 9156 | ♂ | 21.0 | L | — | — | — | — | — | — |
| 9156 | ♂ | 29.0 | L | 26.0 | 6.1 | 7.0 | 6.2 | 4.8 | — |
| 9157 | ♀ | 24.0 | R | 14.0 | 2.9 | 3.2 | 2.5 | 3.0 | 2.2 |
| 9158 | ♀ | 20.0 | L | 11.0 | 2.2 | 2.9 | 1.9 | 2.0 | 1.9 |
| 9159 | ♂ | 41.0 | R | 29.5 | 7.5 | 7.1 | 7.4 | 7.0 | 5.1 |
| 9160 | ♂ | 27.0 | R | 23.0 | 5.1 | 5.2 | 5.2 | 5.2 | 3.8 |
| 9161 | ♂ | 19.0 | R | 13.0 | 2.8 | 3.2 | 2.8 | 2.5 | 2.1 |
| 9162 | ♀ ovig. | 31.0 | L | 15.0 | 3.1 | 4.0 | 2.8 | 2.9 | 2.9 |
| 9163 | ♂ | 19.0 | R | 14.0 | 3.0 | 3.4 | 3.1 | 3.0 | 2.2 |
| 9164 | ♂ | 20.0 | L | 14.5 | 3.0 | 3.5 | 3.1 | 3.3 | 2.5 |
| 9165 | ♂ | 35.0 | R | 28.0 | 6.5 | 8.0 | 6.9 | 4.7 | 5.8 |
| 9166 | ♂ | 32.0 | R | 24.0 | 5.9 | 5.9 | 6.7 | 5.8 | 4.5 |
| 9167 | ♂ | 15.0 | L | 9.5 | 1.9 | 2.2 | 1.9 | 2.0 | 1.8 |
| 9168 | ♂ | 27.0 | R | 22.0 | 5.0 | 6.0 | 5.4 | 4.0 | 4.0 |
| 9169 | ♂ | 27.0 | R | 22.0 | 4.9 | 5.0 | 5.0 | 5.1 | 3.7 |
| 9170 | ♂ | 25.0 | L | 20.0 | 4.5 | 4.9 | 4.9 | 4.7 | 3.5 |
| 9171 | ♂ | 35.0 | R | 27.0 | 6.7 | 5.8 | 6.9 | 6.2 | 4.9 |

Table 3. (continued)

| Cat. No. of Specimen | Sex | Body Length mm | Larger Cheliped | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Side | Total Leng. mm | Merus Leng. mm | Carusp Leng. mm | Carpus Ht. mm | Palm Leng. mm | Dactylus Leng. mm |
| 9172 | ♀ ovig. | 30.0 | L | 15.5 | 3.2 | 4.1 | 2.8 | 2.9 | 2.9 |
| 9173 | ♀ | 21.0 | L | 11.0 | 2.1 | 2.9 | 2.0 | 2.0 | 2.0 |
| 9174 | ♀ | 15.0 | L | 8.0 | 1.8 | 2.2 | 1.4 | 1.5 | 1.7 |
| 9175 | ♀ | 25.0 | R | 14.0 | 2.9 | 3.8 | 2.8 | 2.9 | 2.4 |
| 9176 | ♂ | 29.0 | R | 24.5 | 5.5 | 5.9 | 5.9 | 5.6 | 4.1 |
| 9177 | ♂ | 23.0 | L | 16.0 | 3.7 | 4.5 | 3.9 | 3.1 | 3.2 |
| 9178 | ♀ | 27.0 | R | 14.5 | 3.0 | 3.7 | 2.8 | 2.9 | 2.3 |
| 9179 | ♂ | 26.0 | R | 22.0 | 4.6 | 4.9 | 4.9 | 4.5 | 4.7 |
| 9180 | ♀ ovig. | 25.0 | R | 14.5 | 3.0 | 3.5 | 2.5 | 2.7 | 2.5 |
| 9181 | ♂ | 20.0 | L | 14.0 | 3.1 | 3.7 | 3.1 | 3.3 | 2.6 |
| 9182 | ♂ | 28.0 | — | — | — | — | — | — | — |
| 9183 | ♂ | — | L | 13.0 | 2.8 | 3.1 | 2.9 | 3.0 | 2.1 |
| 9184 | ♂ | 30.0 | R | 24.0 | 6.0 | 6.0 | 6.2 | 6.0 | 4.5 |
| 9185 | ♂ | 24.0 | L | 18.0 | 3.8 | 4.3 | 4.3 | 3.2 | 3.7 |
| 9186 | ♂ | 24.0 | L | 19.0 | 4.5 | 4.7 | 4.5 | 4.6 | 3.2 |
| 9187 | ♂ | 30.0 | L | 23.0 | 5.3 | 5.3 | 5.7 | 5.2 | 4.0 |
| 9188 | ♂ | 36.0 | L | 32.0 | 7.8 | 7.6 | 7.9 | 7.2 | 6.0 |
| 9189 | ♂ | 33.0 | L | 28.0 | 6.5 | 6.5 | 6.5 | 6.5 | 4.8 |
| 9190 | ♂ | 35.0 | L | 32.0 | 7.8 | 7.5 | 7.9 | 7.2 | 5.9 |
| 9191 | ♂ | 27.0 | L | 19.0 | 4.2 | 4.3 | 4.3 | 4.5 | 3.0 |
| 9192 | ♂ | 36.0 | R | 33.0 | 8.0 | 9.0 | 8.3 | 5.9 | 6.4 |
| 9193 | ♂ | 33.0 | R | 28.0 | 6.8 | 7.8 | 6.9 | 5.3 | 6.0 |
| 9194 | ♂ | 36.0 | R | 30.0 | 7.0 | 8.7 | 7.2 | 5.0 | 6.0 |
| 9195 | ♂ | 30.0 | L | 25.0 | 6.0 | 6.9 | 6.2 | 4.6 | 5.1 |
| 9196 | ♂ | 44.0 | L | 31.0 | 7.5 | 8.0 | 8.0 | 6.0 | 6.0 |
| 9197 | ♀ | 26.0 | L | 14.0 | 3.0 | 4.0 | 2.8 | 2.8 | 2.9 |
| 9198 | ♂ | 27.0 | L | 19.0 | 4.7 | 5.2 | 5.0 | 3.8 | 4.1 |
| 9199 | ♀ | 29.5 | R | 15.5 | 3.1 | 4.1 | 3.0 | 2.8 | 2.6 |
| 9200 | ♀ | 29.0 | R | 16.0 | 3.3 | 4.5 | 3.0 | 3.1 | 3.0 |
| 9201 | ♂ | 22.0 | R | 14.0 | 3.3 | 4.0 | 3.4 | 3.0 | 3.0 |
| 9202 | ♂ | 30.0 | L | 19.0 | 3.8 | 5.5 | 3.8 | 3.1 | 3.6 |
| 9203 | ♀ | 28.0 | R | 14.5 | 3.0 | 3.9 | 2.9 | 2.9 | 2.9 |
| 9204 | ♀ | 31.0 | L | 16.0 | 3.2 | 4.1 | 3.2 | 3.1 | 3.0 |
| 9205 | ♀ | 30.0 | L | 15.0 | 3.1 | 4.0 | 3.0 | 2.9 | 2.9 |

Table 4. Measurements of *C. petalura*, body length, length of larger cheliped and dimension of its respective parts; merus length, carpus length and height, palm length and dactylus length.

| Cat. No. of Specimen | Sex | Body Length mm | Larger Cheliped | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Side | Total Leng. mm | Merus Leng. mm | Carpus Leng. mm | Carpus Ht. mm | Palm Leng. mm | Dactylus Leng. mm |
| 1001 | ♂ | 43.0 | R | 37.0 | 8.7 | 9.1 | 6.6 | 9.7 | 6.4 |
| 1002 | ♂ | 51.0 | R | 38.0 | 8.4 | 11.2 | 6.2 | 7.9 | 6.5 |
| 1003 | ♂ | 38.0 | R | 31.5 | 6.9 | 8.5 | 6.0 | 7.0 | 5.8 |
| 1005 | ♂ | 45.0 | — | — | — | — | — | — | — |
| 1006 | ♀ ovig. | 50.0 | R | 32.0 | 7.0 | 8.6 | 5.9 | 6.9 | 5.8 |
| 1007 | ♀ ovig. | 44.0 | — | — | — | — | — | — | — |
| 1008 | ♀ ovig. | 38.0 | R | — | — | — | — | — | — |
| 1009 | ♀ ovig. | 34.0 | — | — | — | — | — | — | — |
| 1010 | ♀ | 34.0 | — | — | — | — | — | — | — |
| 1011 | ♂ | 46.0 | R | 40.0 | 9.1 | 8.4 | 7.1 | 11.0 | 6.5 |
| 1012 | ♂ | 41.0 | R | 33.0 | 7.0 | 7.8 | 6.1 | 8.3 | 5.2 |
| 1013 | ♂ | 35.0 | — | — | — | — | — | — | — |
| 1014 | ♂ | 32.0 | L | — | — | — | — | — | — |
| 1015 | ♀ | 52.0 | — | — | — | — | — | — | — |
| 1016 | — | — | R | — | 7.6 | 10.0 | 5.9 | 7.1 | 5.5 |
| 1017 | — | — | L | — | 4.9 | 5.0 | 4.4 | 5.8 | 4.0 |
| 1018 | — | — | L | 21.5 | 5.0 | 5.5 | 4.2 | 5.0 | 4.0 |
| 1019 | — | — | L | — | 4.5 | 4.9 | 4.1 | 5.0 | 3.8 |
| 2001 | ♂ | 35.0 | — | — | — | — | — | — | — |
| 3001 | ♂ | 31.0 | L | 26.0 | 6.0 | 5.5 | 4.9 | 8.0 | 4.4 |
| 3002 | ♀ | 37.0 | R | 27.5 | 6.1 | 7.0 | 4.8 | 6.1 | 4.9 |
| 3003 | ♂ | 18.0 | L | 12.0 | 2.6 | 2.5 | 2.3 | 3.4 | 2.0 |
| 3004 | ♀ ovig. | — | — | — | — | — | — | — | — |
| 9001 | ♂ | 41.0 | L | 33.0 | 7.6 | 6.5 | 6.4 | 9.9 | 5.9 |
| 9002 | ♀ ovig. | 48.0 | R | 31.5 | 6.8 | 7.8 | 6.2 | 7.1 | 5.5 |
| 9003 | ♀ ovig. | 37.0 | L | 28.0 | 5.8 | 7.0 | 5.1 | 5.9 | 4.9 |
| 9004 | ♀ ovig. | 35.0 | R | 24.0 | 5.2 | 5.9 | 4.7 | 5.7 | 4.7 |
| 9005 | ♀ ovig. | 32.0 | R | 24.0 | 5.1 | 5.8 | 4.3 | 5.4 | 4.5 |
| 9006 | ♀ ovig. | 28.0 | L | — | — | — | — | — | — |
| 9007 | ♀ | 25.0 | L | 18.0 | 3.9 | 4.1 | 3.6 | 4.4 | 3.6 |
| 9008 | ♂ | 34.0 | L | 31.0 | 6.9 | 7.1 | 5.3 | 8.7 | 5.5 |
| 9009 | ♂ | 32.0 | L | 28.0 | 6.4 | 6.3 | 5.3 | 7.7 | 4.8 |
| 9010 | ♂ | 39.0 | R | 33.0 | 7.1 | 8.2 | 6.0 | 7.8 | 5.8 |
| 9011 | ♀ | 38.0 | L | 20.0 | 4.1 | 4.7 | 3.7 | 4.2 | 4.0 |
| 9012 | ♀ | 35.0 | L | 27.5 | 6.0 | 6.5 | 5.4 | 6.7 | 5.5 |
| 9013 | ♂ | 37.0 | R | — | — | — | — | — | — |

Table 4. (continued)

| Cat. No. of Specimen | Sex | Body Length mm | Larger Cheliped | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Side | Total Leng. mm | Merus Leng. mm | Carpus Leng. mm | Carpus Ht. mm | Palm Leng. mm | Dactylus Leng. mm |
| 9014 | ♀ | 10.0 | — | — | — | — | — | — | — |
| 9015 | ♂ | 14.0 | L | 8.0 | 1.8 | 1.9 | 1.7 | 2.1 | 1.9 |
| 9016 | ♀ | 20.0 | L | 10.5 | 2.0 | 2.3 | 1.8 | 2.4 | 2.0 |
| 9017 | ♂ | 10.5 | R | 6.5 | 1.5 | 1.6 | 1.1 | 1.5 | 1.1 |
| 9018 | ♂ | 16.5 | L | 9.0 | 2.0 | 2.1 | 1.6 | 2.1 | 1.9 |
| 9019 | ♂ | 35.5 | R | 27.5 | 6.1 | 7.1 | 4.9 | 6.0 | 4.8 |
| 9020 | ♀ | 33.0 | L | 21.0 | 4.8 | 5.1 | 4.2 | 5.0 | 4.5 |
| 9021 | ♀ | 33.0 | R | 19.5 | 4.0 | 4.5 | 3.8 | 4.5 | 4.0 |
| 9022 | ♀ ovig. | 29.0 | R | 17.0 | 3.7 | 4.1 | 3.3 | 4.1 | 3.5 |
| 9023 | ♀ | 39.0 | L | 24.0 | 5.1 | 5.4 | 4.5 | 5.5 | 4.6 |
| 9024 | ♂ | — | R | 33.0 | 7.5 | 8.0 | 6.0 | 9.0 | 5.8 |
| 9025 | ♀ | 34.0 | L | 24.0 | 5.2 | 5.8 | 4.5 | 5.8 | 4.9 |
| 9026 | ♂ | 40.0 | R | 34.0 | 7.9 | 8.0 | 6.4 | 8.2 | 6.9 |
| 9027 | ♂ | 39.0 | L | 36.0 | 8.1 | 9.7 | 6.5 | 8.3 | 6.8 |
| 9028 | ♀ | 25.0 | L | — | — | — | — | — | — |
| 9029 | ♂ | 39.0 | L | 32.5 | 7.4 | 7.0 | 6.0 | 8.9 | 5.8 |
| 9030 | ♂ | 27.0 | L | 22.5 | 4.9 | 5.3 | 4.3 | 5.9 | 4.1 |
| 9031 | ♂ | 44.0 | L | 36.0 | 8.5 | 9.1 | 6.9 | 8.6 | 6.5 |
| 9032 | ♂ | 33.0 | L | 28.5 | 6.0 | 6.3 | 5.3 | 7.4 | 4.9 |
| 9033 | ♂ | 24.5 | L | 19.0 | 4.3 | 4.3 | 3.8 | 4.9 | 3.9 |
| 9034 | ♂ | 35.0 | R | 34.0 | 7.3 | 8.0 | 6.2 | 9.0 | 5.3 |
| 9035 | ♀ | 28.0 | R | 22.0 | 4.9 | 5.3 | 4.4 | 5.3 | 4.4 |
| 9036 | ♂ | 33.0 | L | 25.0 | 5.5 | 5.8 | 5.0 | 7.0 | 4.3 |
| 9037 | ♀ | 34.0 | R | 21.0 | 4.7 | 5.2 | 4.4 | 4.9 | 4.2 |
| 9038 | ♂ | 38.0 | L | 22.0 | 7.0 | 7.5 | 5.9 | 8.6 | 5.2 |
| 9039 | ♂ | 31.0 | L | 23.0 | 5.6 | 5.8 | 4.9 | 6.6 | 3.9 |
| 9040 | ♀ | 33.0 | L | 21.0 | 4.8 | 5.0 | 4.1 | 5.0 | 4.0 |
| 9041 | ♂ | 35.0 | R | — | — | — | — | — | — |
| 9042 | ♀ | 40.0 | — | — | — | — | — | — | — |
| 9043 | ♀ | 34.0 | R | 18.0 | 3.7 | 4.8 | 3.3 | 3.7 | 3.3 |
| 9044 | ♀ | 30.0 | R | 21.0 | 4.2 | 4.9 | 4.0 | 4.9 | 4.1 |
| 9045 | ♂ | 36.0 | L | 33.0 | 7.8 | 8.9 | 6.2 | 7.8 | 5.6 |
| 9046 | ♀ | 30.0 | L | 22.5 | 2.8 | 5.7 | 4.6 | 5.2 | 4.2 |
| 9047 | ♀ | 33.0 | R | 25.0 | 5.2 | 6.7 | 4.5 | 5.5 | 4.7 |
| 9048 | ♀ | 38.0 | R | 25.0 | 5.5 | 6.1 | 4.7 | 5.9 | 4.9 |
| 9049 | ♀ ovig. | 33.0 | L | 16.0 | 3.1 | 5.0 | 2.2 | 2.9 | 2.8 |
| 9050 | ♂ | 31.0 | R | 24.0 | 5.3 | 6.2 | 4.6 | 5.7 | 4.8 |
| 9051 | ♂ | 19.0 | L | 13.5 | 2.8 | 3.0 | 2.8 | 2.6 | 2.9 |
| 9052 | ♂ | 37.0 | L | 35.5 | 8.1 | 8.4 | 6.8 | 9.5 | 5.8 |
| 9053 | ♀ ovig. | 30.0 | R | 23.0 | 5.2 | 6.0 | 4.7 | 5.3 | 4.4 |
| 9054 | ♂ | 31.0 | R | 25.0 | 5.8 | 6.0 | 5.1 | 7.0 | 4.2 |
| 9055 | ♂ | 30.0 | R | 24.0 | 5.1 | 5.1 | 4.8 | 6.2 | 4.1 |
| 9056 | ♂ | 26.0 | R | 20.0 | 4.4 | 5.1 | 4.1 | 5.0 | 4.0 |
| 9057 | ♀ ovig. | 29.0 | L | 22.5 | 4.8 | 5.3 | 4.4 | 5.3 | 4.5 |

Table 4. (continued)

| Cat. No. of Specimen | Sex | Body Length mm | Larger Cheliped | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Side | Total Leng. mm | Merus Leng. mm | Carpus Leng. mm | Carpus Ht. mm | Palm Leng. mm | Dactylus Leng. mm |
| 9058 | ♂ | 30.0 | L | 25.0 | 5.8 | 6.0 | 4.8 | 7.0 | — |
| 9059 | ♀ ovig. | 35.0 | R | 23.0 | 4.8 | 5.9 | 4.1 | 4.9 | 4.5 |
| 9060 | ♂ | 30.0 | L | 24.0 | 5.1 | 5.7 | 4.9 | 6.3 | 4.4 |
| 9061 | ♂ | 30.0 | R | — | — | — | — | — | — |
| 9062 | ♀ ovig. | 34.0 | L | — | — | — | — | — | — |
| 9063 | ♀ | 24.0 | L | 17.0 | 3.7 | 4.0 | 3.2 | 4.1 | 3.4 |
| 9064 | ♂ | 27.0 | R | 19.0 | 4.8 | 4.6 | 4.4 | 5.2 | 3.9 |
| 9065 | ♀ ovig. | 23.0 | L | — | — | — | — | — | — |
| 9066 | ♀ ovig. | 28.0 | R | 20.0 | 4.5 | 5.0 | 4.0 | 4.8 | 4.0 |
| 9067 | ♀ | 27.0 | L | 21.0 | 4.8 | 5.9 | 4.1 | 4.8 | 4.1 |
| 9068 | ♂ | 33.0 | L | — | — | — | — | — | — |
| 9069 | ♀ ovig. | 26.0 | R | 16.0 | 3.3 | 3.7 | 3.0 | 3.9 | 3.0 |
| 9070 | ♀ | 16.0 | L | 11.0 | 2.7 | 2.7 | 2.3 | 2.9 | — |
| 9071 | ♀ ovig. | 31.0 | L | 24.0 | 5.2 | 5.9 | 5.0 | 5.7 | 4.8 |
| 9072 | ♀ ovig. | 31.0 | R | 22.0 | 5.0 | 5.5 | 4.5 | 5.5 | 4.7 |
| 9073 | ♀ ovig. | 23.0 | R | 15.0 | 3.2 | 3.2 | 3.0 | 3.9 | 3.0 |
| 9074 | ♀ | 25.0 | L | 18.5 | 4.0 | 4.2 | 3.8 | 3.3 | 3.6 |
| 9075 | ♂ | 28.0 | L | 20.0 | 4.3 | 4.5 | 4.0 | 5.3 | 4.0 |
| 9076 | ♂ | 44.0 | L | 43.0 | 9.2 | 10.8 | 7.5 | 10.8 | 6.9 |
| 9077 | ♂ | 46.0 | R | 41.0 | 9.5 | 11.7 | 7.2 | 8.6 | 7.0 |
| 9078 | ♀ | 28.0 | R | 21.0 | 4.8 | 4.9 | 4.0 | 5.3 | 4.0 |
| 9079 | ♀ | 35.0 | L | 23.0 | 4.9 | 5.1 | 4.3 | 5.4 | 4.6 |
| 9080 | ♀ | 28.0 | L | 19.0 | 4.1 | 4.3 | 3.9 | 4.7 | 3.9 |
| 9081 | ♂ | 40.0 | R | 32.0 | 7.8 | 7.8 | 6.4 | 9.1 | 6.0 |
| 9082 | ♂ | 38.0 | L | — | — | — | — | — | — |
| 9083 | ♂ | 21.0 | R | 15.0 | 3.2 | 3.3 | 2.9 | 3.8 | 2.9 |
| 9084 | ♂ | 41.0 | L | 41.5 | 9.2 | 10.0 | 7.5 | 10.7 | 6.8 |
| 9085 | ♂ | 40.0 | L | 37.5 | 8.8 | 9.5 | 7.5 | 10.0 | 5.8 |
| 9086 | ♂ | 31.0 | R | 26.0 | 6.0 | 6.1 | 4.9 | 7.1 | 4.5 |
| 9087 | ♀ ovig. | 37.0 | R | 25.0 | 5.7 | 6.1 | 4.7 | 6.3 | 4.3 |
| 9088 | ♀ | 23.0 | L | 11.0 | 2.1 | 3.0 | 1.9 | 2.1 | 2.0 |
| 9089 | ♂ | 27.0 | R | 22.0 | 5.0 | 5.3 | 4.5 | 5.8 | 4.0 |
| 9090 | ♂ | 24.0 | R | 15.0 | 3.5 | 3.9 | 3.2 | 3.7 | 3.2 |
| 9091 | ♂ | 40.0 | R | — | — | — | — | — | — |
| 9092 | ♂ | 33.0 | L | — | — | — | — | — | — |
| 9093 | ♂ | 24.0 | — | — | — | — | — | — | — |

Table 5. Distribution of the morphological variations of the larger cheliped among the material of *Callianassa japonica* ORTMANN. specimens are given by catalogue numbers.

| Form of | | Male Individual | Female Individual |
|---|---|---|---|
| Dactylus | Propodus | | |
| 1 | 1 | | 9143 9147 |
| 2 | 1 | 9011 | 9014 9173 |
| | 2a | 7014 9202 | 9133 9134 9162 9197 |
| | 2b | 9161 | 7018 9045 9058 9063 9067 9072 9078 9093 9097 9108 9112 9115 9118 9123 9129 9137 9140 9153 9157 9158 9172 9175 9180 9199 9203 9205 |
| | 3a | 9139 | 9178 |
| | 3b | | 9128 |
| | 4a | 9167 9154 | |
| | 6a | 9087 9106 9131 9177 | |
| 3 | 1 | | 9043 |
| | 2a | 7004 7013 7019 9022 | 9009 |
| | 2b | 7009 9135 | 3008 7008 7011 7017 7021 7023 9006 9015 9026 9031 9044 9075 9141 9200 9204 |
| | 3a | | 7012 9012 9019 9023 9080 |
| | 3b | 7005 7010 9010 9046 9051 | 1002 1003 3003 3004 7024 9003 9016 9018 9024 9025 9027 9038 9052 9099 |
| | 6a | 9152 | |
| 4 | 6a | 3002 7106 7025 7026 9056 9059 9069 9085 9092 9110 9127 9196 9198 9201 | |
| | 6b | 9083 9119 | |
| | 6c | 9055 9144 9147 9150 9165 | |
| | 7a | 9057 9066 9098 9114 9185 | |
| | 7c | 9156 | |
| 4′ | 6a | 9090 | |
| | 6b | 9194 | |
| | 7b | 9071 9107 9168 9193 | |
| | 7c | 9062 9064 9096 9109 9111 9195 | |

Table 5. (continued)

| Form of | | Male Individual | Female Individual |
|---|---|---|---|
| Dactylus | Propodus | | |
| 5 | 6a | 9041 | |
| | 7b | 7027 9053 9065 9070 9073 9105 9192 | |
| | 7c | 7022 9079 9113 | |
| 6 | 7b | 9049 | |
| 7 | 5c | 1001 | |
| | 7b | 9021 | |
| 8 | 4b | 9036 | |
| | 5b | 9163 9164 9183 | |
| 9 | 4b | 9029 9047 | |
| | 5a | 9037 | |
| 10 | 4b | 9013 9035 9039 9181 | |
| | 5a | 9081 | |
| | 5b | 9086 9094 9100 9103 9124 9136 9142 9186 9191 | |
| 11 | 4b | 9054 | |
| | 5b | 7001 9089 9095 9121 9149 9169 9170 9179 | |
| 12 | 4b | 7015 | |
| | 5a | 9082 9084 9117 9122 9125 9130 9145 9146 9160 | |
| | 5b | 9060 9061 9068 9077 9088 9091 9104 9116 9132 9138 9151 9159 9166 9176 9184 9187 9188 | |
| | 5c | 9017 9034 9048 9148 | |
| 13 | 4b | 3001 | |
| | 5a | 9001 9101 | |
| | 5b | 9120 9126 9171 9189 | |
| | 5c | 9033 9190 | |
| 14 | 5a | 9076 | |
| | 5b | 9002 9007 9028 9050 | |

Table 6. Distribution of the morphological variations of the larger cheliped among the material of *Callianassa petalura* STIMPSON. Specimens are shown by catalogue numbers.

| Form of | | | Male Individual | Female Individual | Sexuality Undetermined |
|---|---|---|---|---|---|
| Dactylus | Propodus | Fixed Finger | | | |
| 1 | 1 | 1 | 9018 | 9016 9049 9088 | |
| | 2a | 1 | | 9043 | |
| | 2b | 1 | 9017 | 9021 9022 9040 | |
| | 2c | 1 | | 1006 9004 9011 9020 9044 9046 9047 9048 9059 9069 9072 9073 | |
| | 2d | 1 | 1002 1003 9019 9027 9050 9056 9077 9090 | 9003 9005 9007 9023 9025 9035 9037 9053 9057 9063 9036 9067 9071 9079 9080 | 1016 |
| | 2d | 2 | 9031 | 3002 | |
| | 2d | 3 | | | |
| | 3b | 1 | 9015 | | |
| | 3c | 1 | 9051 | | |
| | 3d | 3 | | | 1019 |
| 2 | 2a | 1 | | 9002 | |
| | 2c | 1 | 9010 | 9087 | |
| | 2d | 1 | 9045 | 9012 9074 | |
| | 2d | 2 | 9026 | | 1018 |
| | 2d | 3 | | | 1017 |
| 3 | 3c | 1 | 9083 | | |
| | 3c | 2 | 9033 | 9078 | |
| 4 | 3c | 3 | 9064 9075 | | |
| | 3c | X | 1001 | | |
| 5 | 3b | 3 | 9089 | | |
| | 3d | 3 | 3001 3003 9001 9029 | | |
| 6 | 3a | 3 | 9039 | | |
| X | 3a | 3 | 9058 | | |
| 6 | 3b | 3 | 9030 | | |
| | 3c | 3 | 9036 | | |
| | 3d | 3 | 9054 9060 | | |
| 7 | 3c | 3 | 9008 9009 9024 9032 9034 9038 9052 9055 9076 9081 9084 9085 9086 | | |
| | 3d | 3 | 1011 1012 | | |

Table 7. The carapace length and the length of the larger cheliped from carpus to dactylus in *C. japonica*.

| Sex | Cat. No. | Body Length mm | Carapace Length mm | Length of Larger cheliped mm |
|---|---|---|---|---|
| | 3002 | 40.5 | 10.0 | 16.8 |
| | 7015 | 40.0 | 9.0 | 17.5 |
| | 7016 | 39.5 | 9.2 | 19.5 |
| | 9001 | 38.0 | 8.5 | 19.5 |
| Male | 9037 | 41.0 | 9.0 | 17.0 |
| | 9039 | 40.0 | 9.7 | 17.0 |
| | 9046 | 40.0 | 9.0 | 15.5 |
| | 9070 | 38.0 | 9.0 | 20.0 |
| | 9159 | 41.0 | 9.0 | 18.5 |
| | 7011 | 40.0 | 9.5 | 14.5 |
| | 7021 | 39.5 | 8.9 | 13.5 |
| | 7023 | 39.0 | 8.6 | 12.5 |
| Female | 9006 | 40.5 | 9.5 | 12.0 |
| | 9009 | 38.0 | 9.0 | 12.0 |
| | 9031 | 40.0 | 9.0 | 13.0 |
| | 9045 | 38.0 | 8.5 | 12.5 |
| | 9118 | 38.0 | 7.0 | 9.8 |

Table 8. The carapace length and the length of the larger cheliped from carpus to dactylus in *C. petalura*.

| Sex | Cat. No. | Body Length mm | Carapace Length mm | Length of Larger cheliped mm |
|---|---|---|---|---|
| | 1003 | 38.0 | 8.8 | 20.0 |
| | 1012 | 41.0 | 9.5 | 19.5 |
| | 9001 | 41.0 | 10.0 | 21.0 |
| | 9010 | 39.0 | 9.0 | 21.0 |
| | 9026 | 40.0 | 9.0 | 21.0 |
| Male | 9027 | 39.0 | 9.0 | 23.5 |
| | 9029 | 39.0 | 9.8 | 20.0 |
| | 9038 | 38.0 | 8.5 | 20.5 |
| | 9081 | 40.0 | 8.9 | 21.0 |
| | 9084 | 41.0 | 10.3 | 26.5 |
| | 9085 | 40.0 | 9.5 | 24.0 |
| | 3002 | 37.0 | 9.0 | 17.0 |
| Female | 9011 | 38.0 | 7.9 | 12.2 |
| | 9023 | 39.0 | 8.9 | 14.5 |
| | 9048 | 38.0 | 7.8 | 16.0 |

Table 9. Individuals of respective dactylus forms in relation to the length proportion of carpus to palm.

| sp. | Locality | Dactylus form | α type (Palm > Carpus) | | β type (Palm = Carpus) | | γ type (Palm < Carpus) | |
|---|---|---|---|---|---|---|---|---|
| | | | ♂ | ♀ | ♂ | ♀ | ♂ | ♀ |
| *C. japonica* | Other loc. than Amakusa | A | 0 | 0 | 0 | 0 | 2 | 3 |
| | | B | 0 | 0 | 2 | 1 | 18 | 29 |
| | | C | 19 | 0 | 1 | 0 | 0 | 0 |
| | Amakusa | A | 0 | 0 | 0 | 0 | 9 | 33 |
| | | B | 0 | 0 | 0 | 0 | 44 | 6 |
| | | C | 7 | 0 | 11 | 0 | 37 | 0 |
| *C. petalura* | Around Japan | A | 2 | 10 | 1 | 8 | 13 | 21 |
| | | B | 30 | 1 | 1 | 0 | 0 | 0 |

## EXPLANATION OF PLATES IX-XV

PLATE IX. The larger cheliped of *C. japonica*.

a. A female from the estuary of the Muromi River, Hakata Bay, Cat. No. 9026, showing the form D3–P2b.
b. A male from the estuary of the Tatara River, Hakata Bay, Cat. No. 9015, showing the form D3–P2b.
c. A male from Kanazawa-hakkei, Tokyo Bay, Cat. No. 3002, showing the form D4–P6a.
d. A male from the estuary of the Ohta River, Hiroshima, Cat. No. 7016, showing the form D4–P6a.

PLATE X. The larger cheliped of *C. japonica*.

a. A male from Higashihama Beach, Amakusa I., Cat. No. 9065, showing the form D5–P7b.
b. A male from the estuary of the Ohta River, Cat. No. 7027, showing the form D5–P7b.
c. A male from Funka Bay, Hokkaido, Cat. No. 1001, showing the form D7–P5c.
d. A male from Momoji Beach, Hakata Bay, Cat. No. 9021, showing the form D7–P7b.

PLATE XI. The larger cheliped of *C. japonica*.

a. A male from the estuary of the Muromi River, Hakata Bay, Cat. No. 9036, showing the form D8–P4b.
b. A male from the estuary of the Muromi River, Cat. No. 9035, showing the form D10–P4b.
c. A male from Higashihama Beach, Amakusa I., Cat. No. 9086, showing the form D10–P5b.
d. A male from Higashihama Beach, Cat. No. 9122, showing the form D12–P5a.

PLATE XII. The larger cheliped of *C. japonica*.

a. A male from Kanazawa-hakkei, Tokyo Bay, Cat. No. 3001, showing the form D13–P4b.
b. A male from Higashihama Beach, Amakusa I., Cat. No. 9126, showing the form D13–P5b.
c. A male from the estuary of the Muromi Beach, Hakata Bay, Cat. No. 9033, showing the form D13–P5c.
d. A male from Najima Beach, Hakata Bay, Cat. No. 9007, showing the form D14–P5b.

PLATE XIII. The larger cheliped of *C. petalura*.

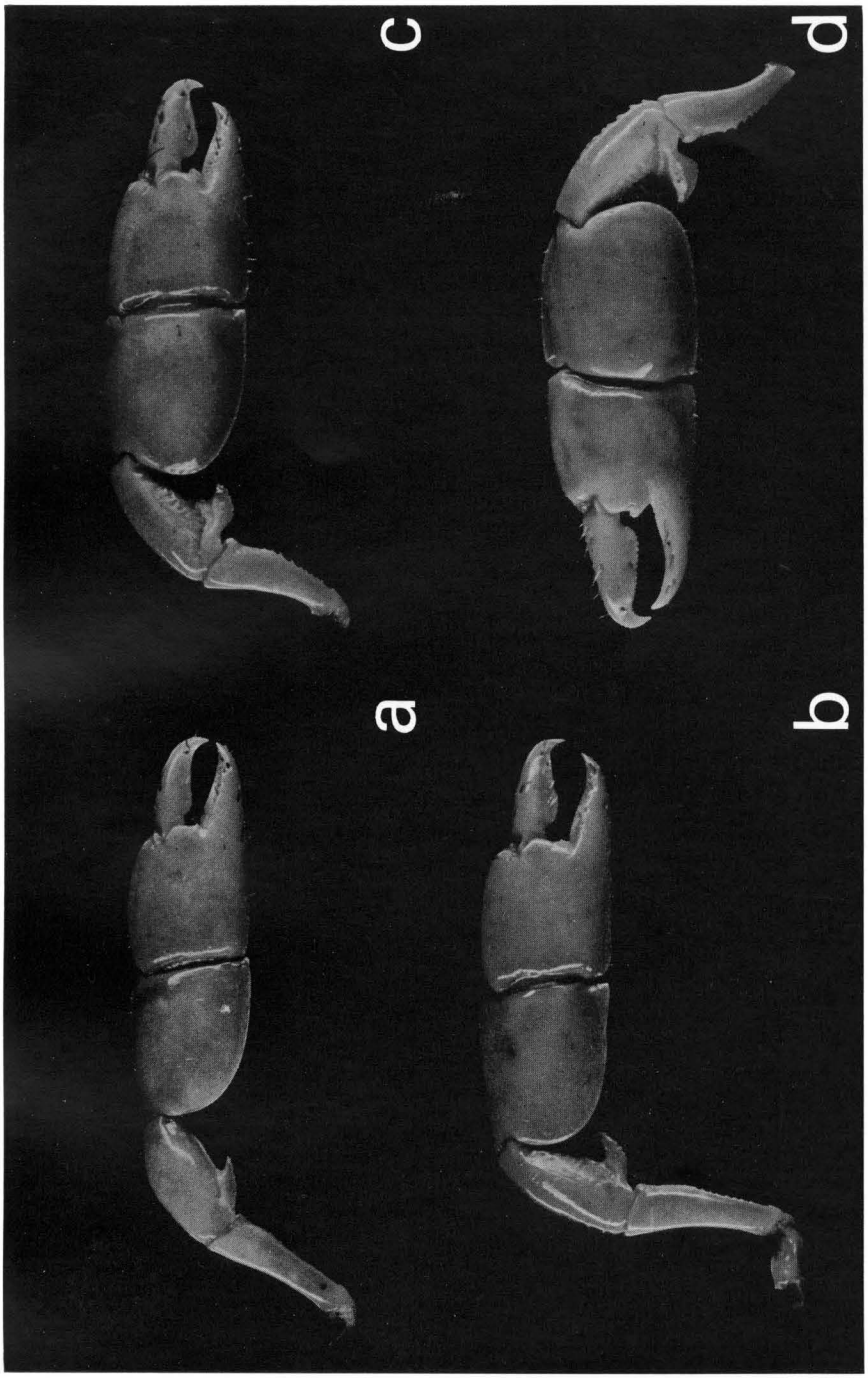
a. A female from Tsuyazaki Beach, Fukuoka, Cat. No. 9020, showing the form D1–P2c–F1.
b. A male from Shiriki-shinai, Hokkaido, Cat. No. 1003, showing the form D1–P2d–F1.
c. A male from Shiriki-shinai, Cat. No. 1002, showing the form D1–P2d–F1.
d. A male from Tsuyazaki Beach, Cat. No. 9027, showing the form D1–P2d–F1.

PLATE XIV. The larger cheliped of *C. petalura*.

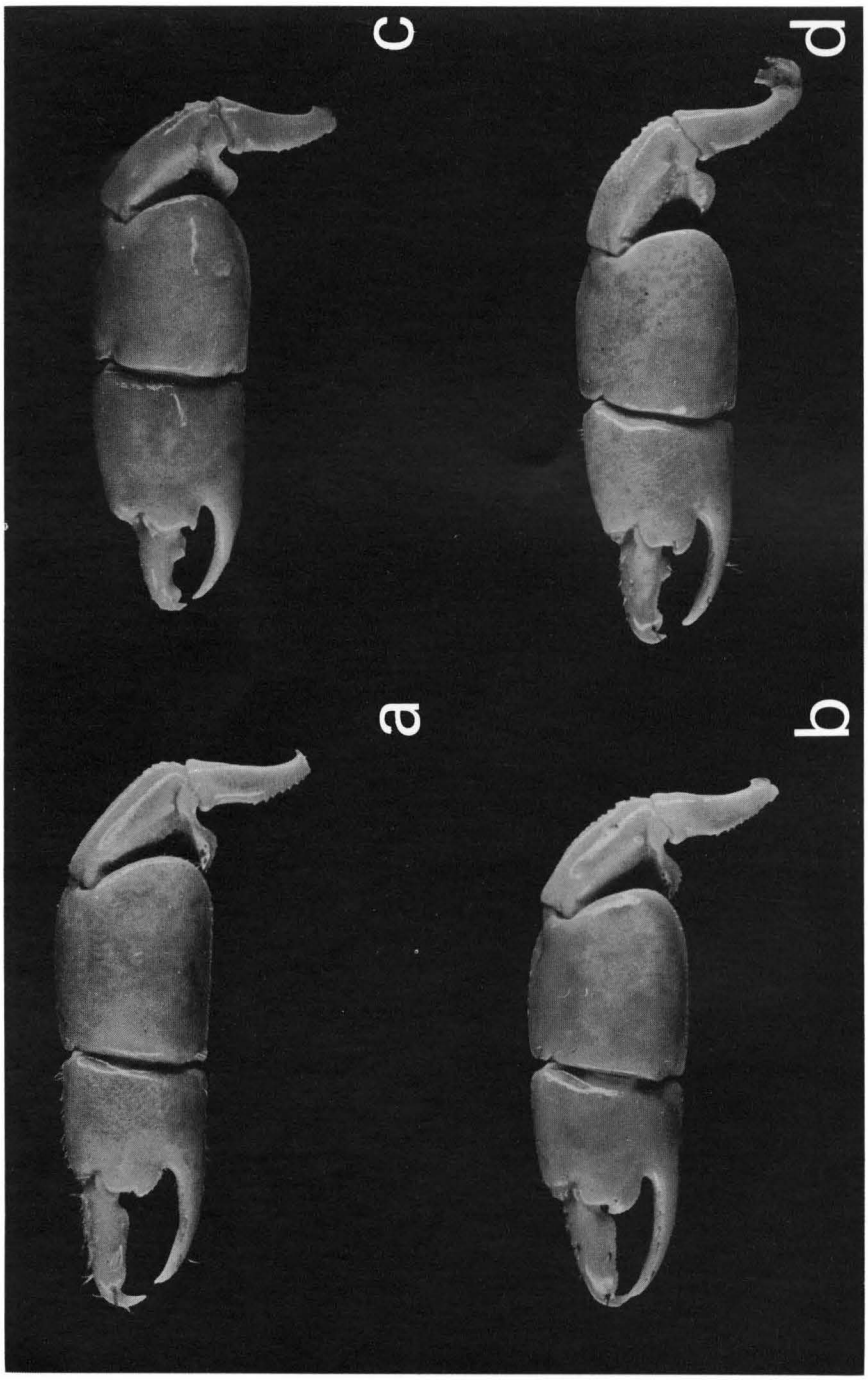
a. A male from Tsuyazaki Beach, Fukuoka, Cat. No. 9031, showing the form D1–P2d–F2.
b. A female from Tsuyazaki Beach, Cat. No. 9078, showing the form D3–P3c–F2.
c. A male from Tsuyazaki Beach, Cat. No. 9064, showing the form D4–P3c–F3.
d. A male from Okinoshima I., Fukuoka Pref., Cat. No. 9001, showing the form D5–P3d–F3.

PLATE XV. The larger cheliped of *C. petalura*.

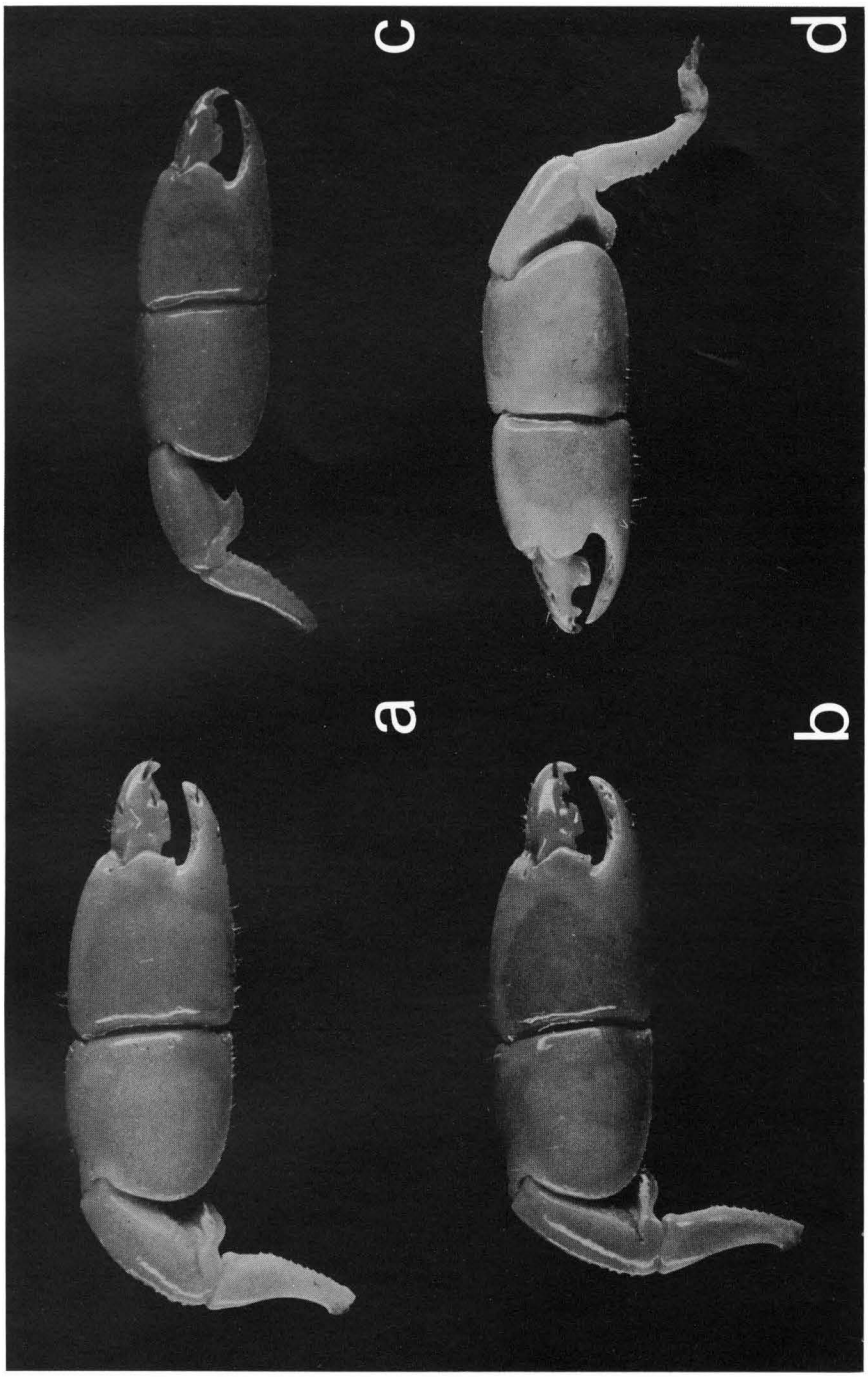
a. A male from Tsuyazaki Beach, Fukuoka, Cat. No. 9029, showing the form D5–P3d–F3.
b. A male from Tsuyazaki Beach, Cat. No. 9030, showing the form of D6–P3b–F3, showing the form D6–P3b–F3.
c. A male from Tsuyazaki Beach, Cat. No. 9076, showing the form D7–P3c–F3.
d. A male from Tsuyazaki Beach, Cat. No. 9081, showing the form D7–P3c–F3.




K. SAKAI: *Revision of Japanese Callianassids*




K. SAKAI : *Revision of Japanese Callianassids*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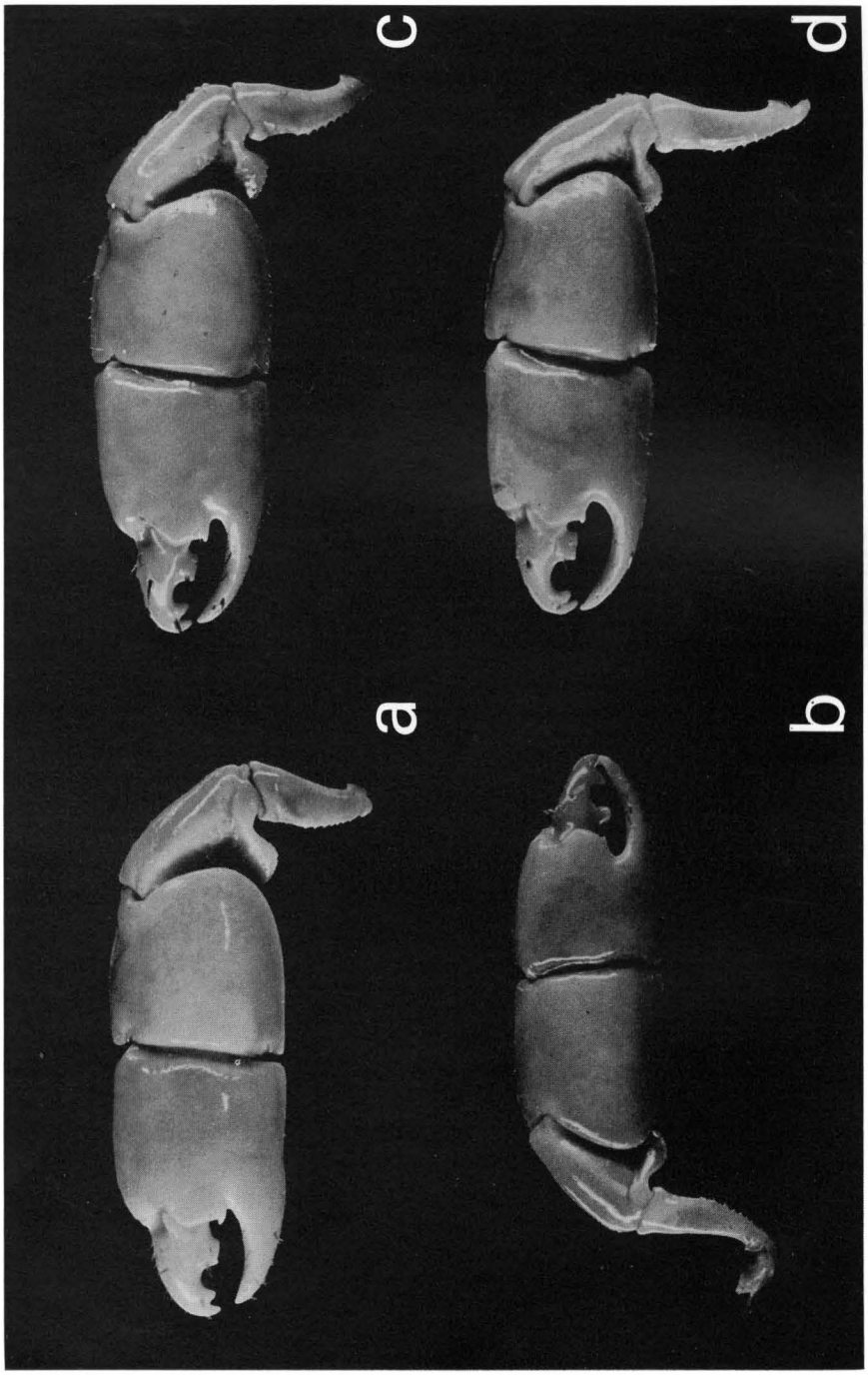


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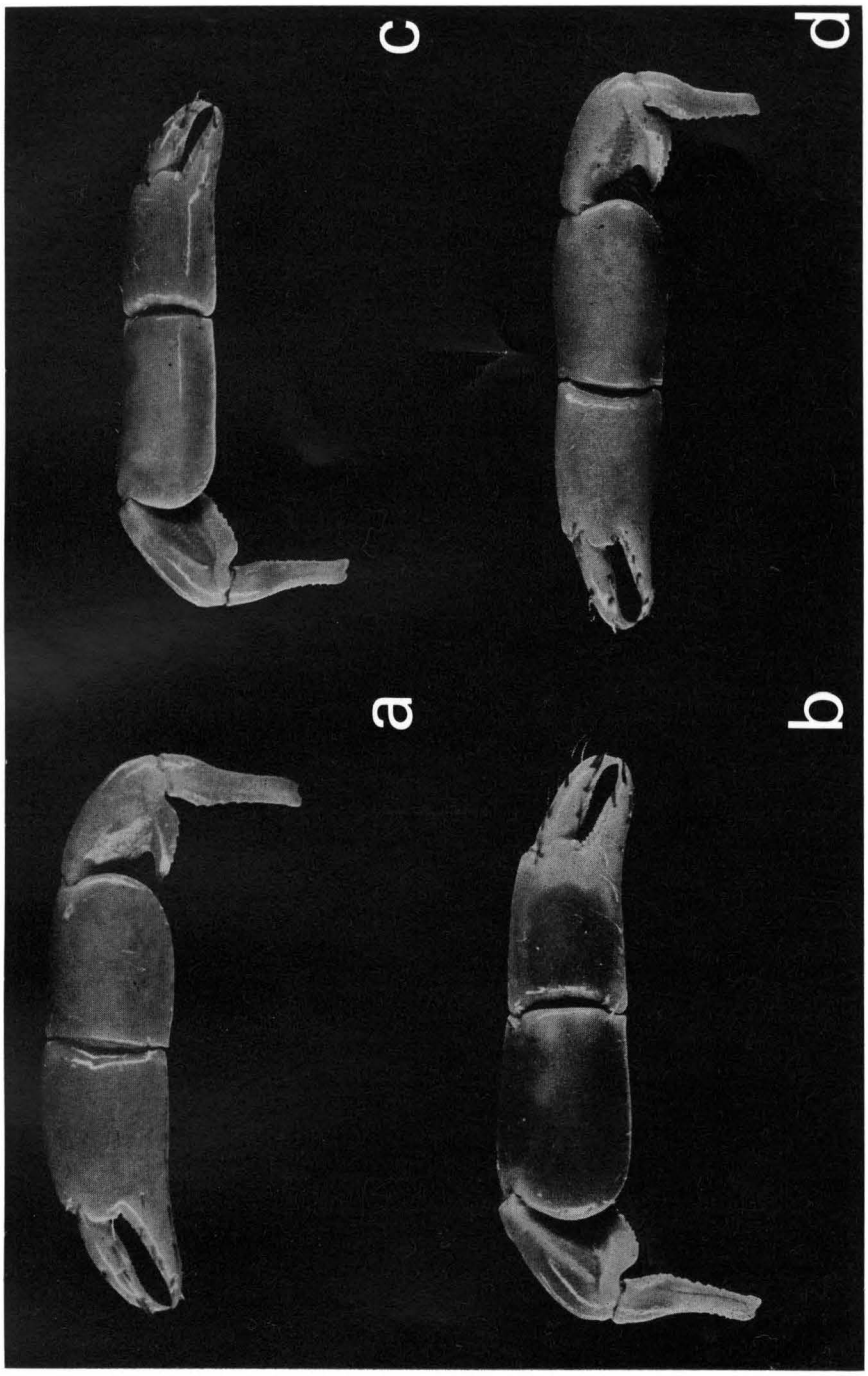


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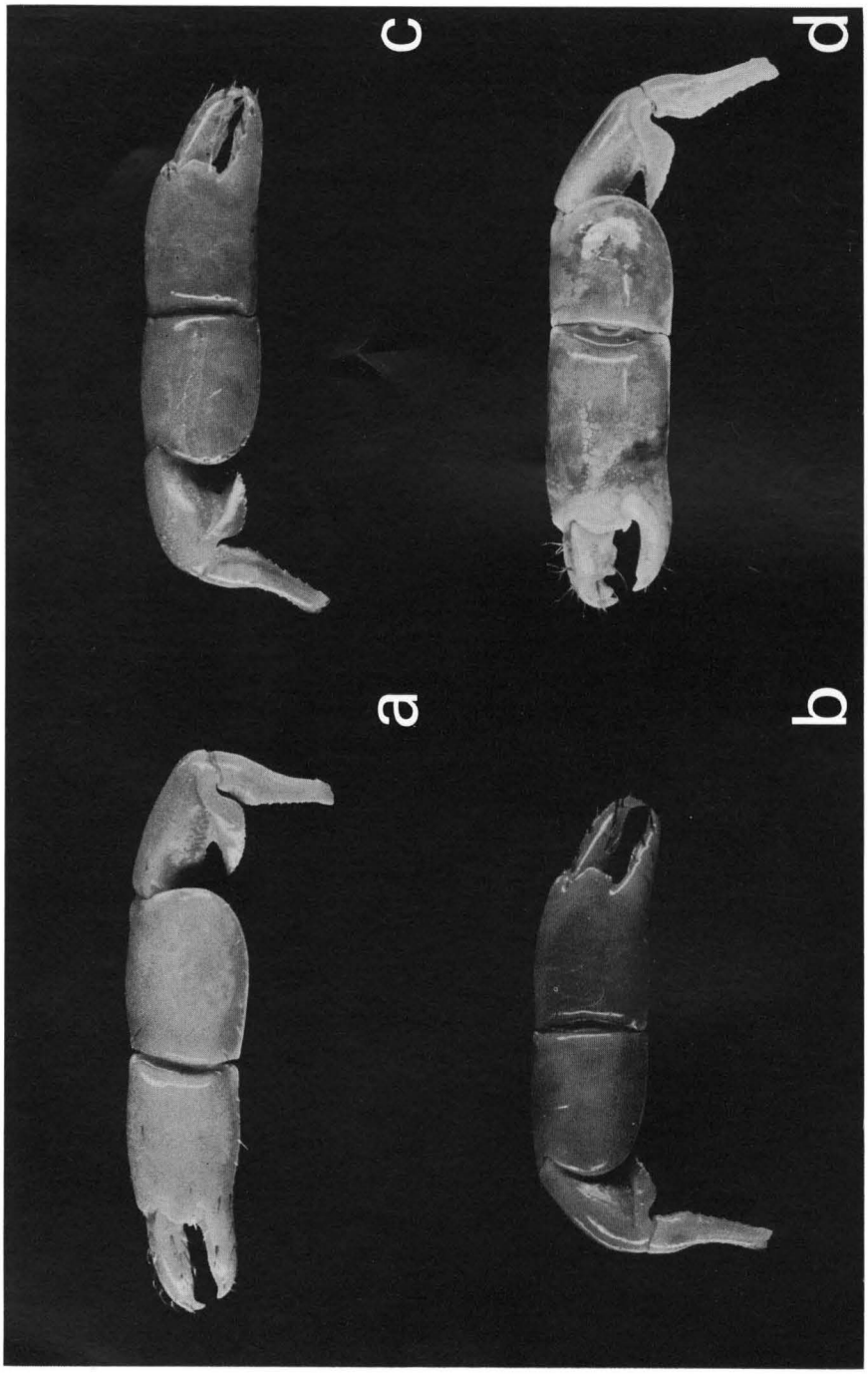


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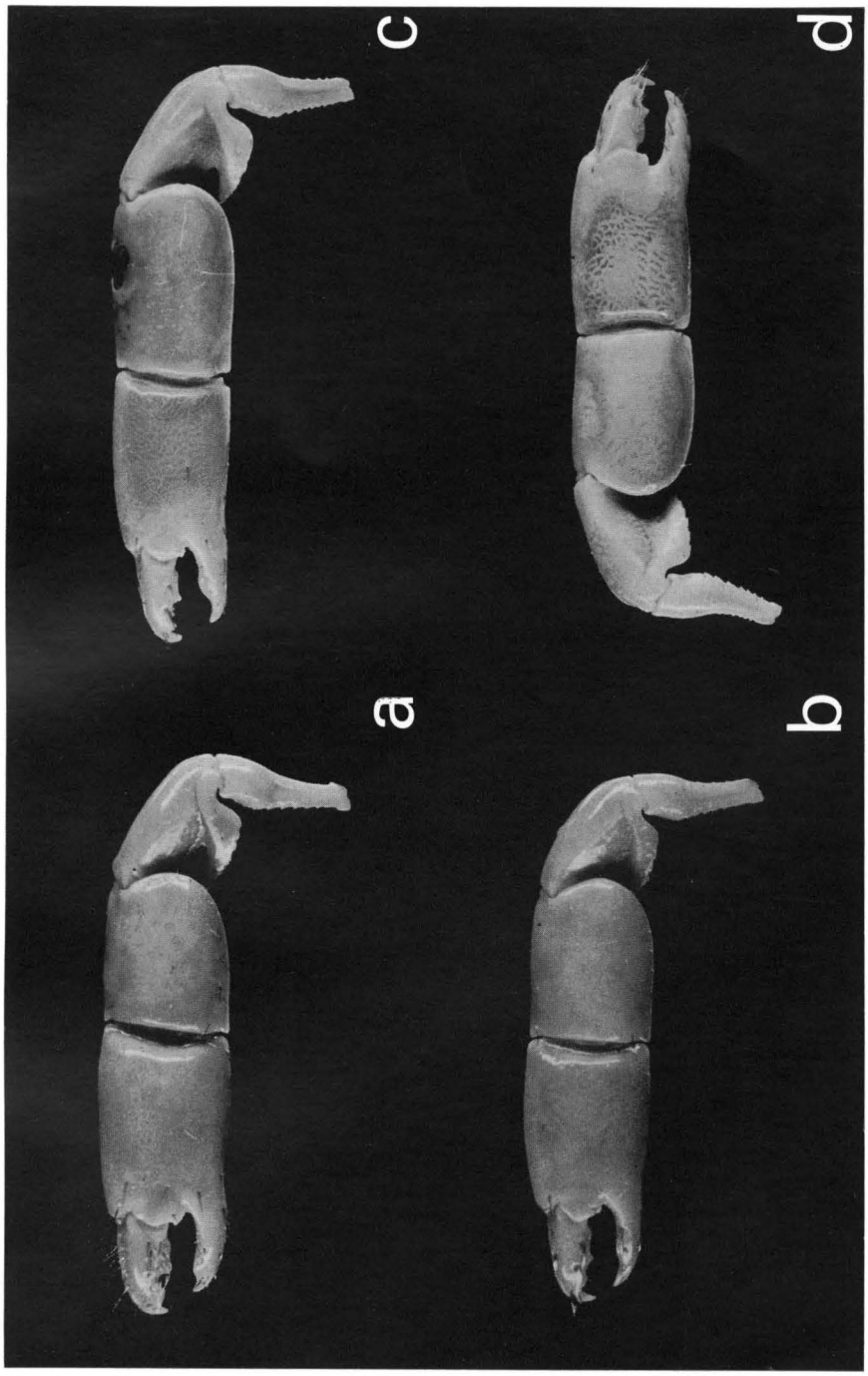


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